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THE FOOD SITUATION.

The present crisis in regard to the rice supplies of the Colony has resulted in the Department of Agriculture and the Agricultural Society being inundated with queries as to "what can be planted." One has been tempted to reply to all such queries: "Plant all you can, and what you can." For the past five years, a campaign has been conducted in regard to the urgent necessity of securing greater food supplies in the colony.

The rice situation has been discussed, paddy cultivation dealt with, and information given on the cultivation of maize and other cereals, yams and other tuberous crops, vegetables and currystuffs. A study of the TROPICAL AGRICULTURIST during the past three years will give all cultivators the information that they are likely to require in regard to tropical food crops.

But what has occurred—a policy of "wait and see" has not been productive of large stocks of food in the colony, and the country has now been awakened to the fact that starvation even in these days of rapid transport is still a possibility.

Preparations in most parts of the colony are now being made for the North-East Monsoon crops. No one should hesitate —for the utmost efforts of all are required. Let us all make up our minds that a supreme effort is necessary, if we are to make our supplies for next season at all certain.

It is the combined effort of all that is now required. The colony is faced with a difficult situation, and it can be relied upon to rise to the occasion. Food is the necessity of the day, and is likely to be the necessity of the morrow. Let us remember that it is the agriculturist that raises the food and that it is to

the agriculturist that the colony turns for assistance. This is his chance to prove that he is still the foundation upon which the rest of the colony depends.

NOW THE QUESTION ARISES AS TO WHAT SHOULD BE GROWN.

Under cereals, paddy should hold first place. Every effort must be made to increase our out-turn of paddy. Better cultivation methods, transplanting, manuring, better irrigation, and the opening of new lands must be undertaken. *El-wee* (or hill paddy) is suited to high lands in districts that receive a fair rainfall during the crop period, *Amu* can be recommended in the moderately damp localities, and maize and kurakkan are suited to the drier places. Maize can be grown in damp locations if a dry period can be depended upon during the ripening period. Damp maize will not keep and half-dry maize is very liable to insect attack.

Yams will grow all over the colony. Sweet potatos, manioc, tannia and dioscorea yams should be planted by all. The first two will succeed in all locations, while the last two demand a reasonable amount of moisture for even moderately-satisfactory crops. Yams may be looked upon as the mainstay of the villager in time of stress. They should be planted up by all.

Plantains in the damper localities and in areas not liable to be wind-swept are deserving of attention. They yield large quantities of food from a given area.

Beans and pulses can be grown anywhere in this colony, but they naturally ripen more satisfactorily, where dry periods can be depended upon. There is absolutely no reason why Ceylon should not grow the whole of its requirements of pulses.

Vegetables can also be grown. The European vegetables are suited for the higher elevations, while there are many highly nutritive local vegetables that give good returns in the Low-Country.

Onions can also be grown in almost all parts of the colony, chillies can also be grown in quantities, and other currystuffs can be raised in certain localities suited to their cultivation.

There is no reason why Ceylon should not produce much more food. The next few months are the critical ones as far as cultivations are concerned, and the efforts of all must be directed towards bumper crops during the North-East Monsoon.

FOODSTUFFS.

CORN AND BEANS.

After wheat and rice, maize or Indian corn is the most important cereal food of mankind. Since its introduction into Europe, it has enjoyed great and ever-increasing popularity, until at the present time its distribution is almost world-wide, and it forms the basis of the diet of a large proportion of the human race.

Corn may be eaten either green or fully-matured. Eaten green, just between the milk and the dough state, it is delicious. Its food value is considerable, being about 460 calories per pound, divided as follows: Ash, 0·7 per cent.; protein, 3·1 per cent.; carbohydrates, 19·7 per cent ; and water, 75·4 per cent. Green corn is easily preserved for future use, either by canning or drying.

Corn finds its most extensive use in the dried or ripened state. It compares very favourably with other staples, wheat and rice, in food value. Pound for pound, it furnishes more energy than either of them because of its higher fat-content which constitutes 4·3 per cent. Protein makes up 10 per cent.; carbohydrates 73·4 per cent.; ash 1·5 per cent.; and water 10·8 per cent. It produces 1,685 calories per pound as compared with 1,625 per pound of wheat, and 1,620 per pound of rice.

Corn parched or in the form of corn-meal has almost endless possibilities in the diet. Whether simply boiled with salted water to make mush, or made into corn-bread, griddle cakes, pons, pudding or cake or fried and eaten with syrup, is a very palatable, nutritious and easily prepared dish.

Filipinos, who are accustomed to a diet of rice and fish will find maize in its various forms a very valuable addition to their diet. It will furnish them with more protein and fat than they are accustomed to take and which most of them need badly.

The ease with which corn is grown in the Philippines should place it within the reach of all. It is included in the list of plants recommended for the home vegetable gardens.

Next to the cereals, the legumes are the most important food crops in the world. On every Continent and in every Country, some member of the bean family is an important article of diet.

In Mongolia, the soy bean, in India the lentil, in Mexico the frijols are popular, while in the United States and Northern Europe the different varieties of the kidney bean find most favour. No country confines itself to a single variety however.

The great food value of the legumes has been recognised for ages. They have been called the "meat of the poor." The Hindu proverb: "Rice is good, but lentils are my life," illustrates the high esteem in which legumes are held in India. Baked beans is a dish enjoyed by most of us.

Modern science has proven the ancient beliefs. Whether eaten green or in the ripened state, their food value is very great. According to analysis by the United States Bureau of Agriculture, the different varieties of green beans and peas, as sold on the market, contain from 2·3 to 9·4 per cent. of protein; 0·3 to 0·7 per cent. of fat; and 3·8 to 29·1 per cent. of carbohydrates. The same vegetables, when fully ripe contain from 18·1 to 34·0 per cent. of protein . 1·0 to 16·8 per cent. of fat; and 38·7 to 65·9 per cent. of carbohydrates. Those varieties which have a high fat-content contain less carbohydrates, and *vice-versa*.

The energy-producing or heating value of legumes ranges from 95 to 740 calories per pound, when green; and from 1,590 to 1,970 calories per pound when mature. Their food value averages higher than any other class of food except the fats. In fact, their high caloric value is due in part to the presence of fat.

The constituents of prime importance to the Filipino people is protein. In a country where the poor are often unable to obtain meat or eggs, but must rely on fish and vegetables, the legumes are an exceedingly important part of the dietary. The presence of vitamins in abundance, makes them valuable in the prevention and treatment of nutritional diseases such as beri-beri.

There are many varieties of legumes which grow readily in the Philippine Islands. Three of these have been incorporated into the model garden, viz: Canadian Wonder Beans, New Era Cowpeas and the common Philippine Mungo. From these and the many other varieties adapted to this climate, it should be an easy matter for the Filipino gardener to select seed suitable for his particular use.

There are many reasons why the legumes occupy the foremost place in the home vegetable garden. A few of the most important are: Their great food value; their high protein content; their richness in vitamins; their great variety; and their ease of production.—PHILIPPINE FARMER, Vol. V., No. 4.

TOMATO SOY.

Green Tomatos.—There will be many, especially among the small growers, this season, who will have quantities of green tomatos which, owing to the somewhat indifferent season experienced for this crop, will not become sufficiently far advanced to ripen. In a year, when all food stuffs are so valuable, extra care should be taken to bring intcluse all that is possible from the holding or garden. Some years ago a friend from Canada gave us a recipe which we have always found to be excellent for making green tomatos into soy. It is as follows: To every 2 gallons of green tomatos, not peeled, but sliced, add 12 fair-sized onions, sliced, 1 quart of good vinegar, 1 quart Demerara sugar, 2 table-spoonfuls of salt, 2 oz ground mustard, 2 oz. black pepper, 1 oz. ground all-spice, 1 oz. ground cloves; mix together and boil until tender. The soy must be kept stirred to prevent burning. Put up in small glass jars, which may be either screw topped or tied down in the usual way as jam is done. This will be found to be a condiment or sauce which can be used either with meat or fish, and we think it should find a ready sale in restaurants and eating houses where, of course, it could be eaten freshly made. Half an ounce of cayenne pepper may be added to advantage for those who like hot soy. The tomatos, needless to say, should be full-grown and quite sound. It should be stored in any place where jams will keep well. This is quite the best use to which the green tomato can be put and not one fruit should be wasted.—JAMAICA AGRIC. SOCIETY, Vol. XXIII., No. 1.

THE JERUSALEM ARTICHOKE.

The following article on "Jerusalem Artichoke" taken from the JOURNAL OF THE DEPARTMENT OF AGRICULTURE, VICTORIA, for April, 1919, will be of interest at the present time.

Another article on the same subject appeared in the TROPICAL AGRICULTURIST for July, 1918.

The Jerusalem artichoke *(Helianthus tuberosus)*, a plant of the natural order Compositæ, is a native of North America. It is a hardy perennial herb with rod-like stems 6 to 8 feet in height, and many subcordate petioled leaves and clustered tuberous roots. There are several varieties, which are distinguished by the colour of the tubers—red, white, and yellow—and by the shape of the leaves, which are either narrow or broad. The tubers (rhizomes) are used as a vegetable, principally during the winter, sometimes as a dish, but more generally for flavouring purposes. They are considered both wholesome and nutritious, and may be given to invalids, when abstinence from other vegetable food is necessary. Before the potato became plentiful, they were widely used in Europe, and they are still in great demand there for flavouring soups.

Jerusalem artichoke or topinambour are extensively cultivated in France for distilling purposes (as are potatos and beet roots), yielding as much as 7 to 9 per cent. of absolute alcohol. According to PAYEN, the average analysis of the tubers of Jerusalem Artichoke, is as follows :—

	Water		76·04
	Glucose and Crystallizable Sugar ...	14·70	
1.	Inulin	1·86	
	Cellulose	1·50	
	Pectic Acid and Pectin ...	1·29	
	Albumine and N. matters ...	3·12	
	Fatty matters	0·20	
2.	Mineral Salts	1·29	23·96
			100·00

(1) Inulin belongs to the amyloid group of the carbohydrates, and occurs in the roots of some plants, among which may be mentioned, in addition to the Jerusalam artichoke, the dahlia. Inulin is intermediate between gums and starch, and yields fermentescible sugar by prolonged boiling with dilute acid.

(2) Of the mineral salts, more than one-fifth is potash.

The composition of these tubers varies very much, according to the time they are dug up. The percentage of crystalline sugar is largest during the cold season, while during the summer, starch—like inulin, gummy matters, and glucose—prevails. The tubers form very late, and should not be dug before the stems fade off, viz., in the autumn.

CULTIVATION.

The plant will succeed on a variety of soils, but generally gives the best results, when grown on rich sandy loams. To ensure the most successful

results, trench over a piece of ground in the autumn and give a light dressing of nitrogenous and potassic manures, fork over in September, and then plant good-shaped tubers in rows about 3 feet apart, allowing from 18 inches to 2 feet between the tubers in the lines. About 4 bushels will plant an acre. Artichokes may, with considerable advantage, be grown in rotation with maize.

When the plants are well above the soil, they will keep in check any ordinary farm-weeds, and very little cultivation will be required. Ten to twelve tons of tubers are considered an average crop. More attention is now being paid to the cultivation of Jerusalem artichokes, as they are known to be good pig food, and they are usually harvested by turning the animals into the field. The tubers will keep in the ground all the winter, and usually enough of them are left by the pigs to produce a new crop. An important element in their value for the feeding of swine is their availability during the entire winter and spring, and the fact that their harvesting costs nothing. Though artichokes are but little affected by frost, they do not stand storing in pits and silos, like beet-root and potatos.

This plant has of late years grown into favour as a marketable crop, and the demand seems to be increasing. Considering its very easy culture, it is fairly remunerative.

The following are the peculiar advantages of the Jerusalem artichoke over other fodder plants, capable of being grown in this state :—

(1) It does not require to be planted every year ; (2) it will yield more to the acre than potatos ; (3) it does not require harvesting ; (4) it stands frost well ; (5) it increases the yield of dairy cows to an extraordinary degree, and improves the quality of the milk ; (6) it is one of the cheapest and healthiest pig foods raised, and is also an excellent food for cattle, sheep, and horses ; and, finally, (7) it is highly important, because no insect, blight, or rust attacks it.

RUNNER BEANS.

E. JONES.

The Runner Bean is a vegetable of great utility, and may be advantageously grown by all. To obtain the best results in crop and quality, abundant supplies of food and moisture are necessary, or the pods will be tough and flavourless. The Runner Bean is able to assimilate a large amount of plant-food, and the results depend on the amount available in the soil. In this respect it differs from certain other crops of the kitchen garden. Onions, for example, grown on excessively rich soil, are not so fine in quality as when planted in moderately-fertile ground, whilst roots of the culinary pea will not tolerate animal manure in quantity. The Runner Bean is able to take full advantage of a rich rooting medium, and provided with plenty of manure, it will grow rampantly and produce large quantities of its valuable pods.

By way of experiment, I have planted Runner Beans on manure heaps, where they have thriven amazingly, the only difficulty being that sometimes

the blooms dropped off instead of setting, but this was entirely rectified by two applications of sulphate of potash, at the rate of one ounce to one gallon of water. But I do not recommend growing the plants in rank manure only, for not only is such an extreme course unnecessary, it is obviously wasteful of manure. Fair crops may sometimes be obtained from plants grown in unmanured ground in average seasons, but if a period of drought occurs, the crop will be poor and the pods tough and stringy.

For many reasons the trench system is undesirable ; in heavy, damp soils, the trench acts as a drain in rainy weather, and the sinking caused by the decomposing manure, causes many of the roots to become broken. It is a much better plan, if the necessary labour is available, to spread the manure over the ground and trench the land, placing most of the manure at the bottom of the trenches as the work of digging proceeds.

The root-system of the Runner Bean develops to a large extent, laterally, and, on shallow soil, during wet weather, innumerable roots may be seen penetrating the surface for some distance from the plant. These roots generally perish in times of drought.

Deep cultivation should be practised to encourage the roots to grow into the moist soil below, where they will be safe from drought and the effects of hot sunshine. Generally, surface mulchings of manure are inadvisable on account of encouraging surface rooting, it being better to stir the surface soil frequently to create a dry mulch of dusty soil which the roots will not enter.

Surface mulchings may be advantageously applied in certain circumstances, such as on heavy wet soils, where the ground is liable to crack, and which defy hoeing after a period of rain.

Many growers maintain that a light, dry mulch is beneficial during hot weather, a point I concede, provided the drought continues. In our variable climate, it is impossible to forecast the weather for any considerable length of time ; long periods of wet weather frequently follow drought. In such conditions, the driest of light mulchings become sodden, and partly decay ; the roots invariably enter such material and this entails the provision of another mulch for protection when drought returns. The only way of preventing this trouble is to remove the mulch, when rains fall, a process too laborious for most gardeners to undertake. On light soils a light, dry mulch is easily obtained by frequently stirring the surface, a process which involves less labour, and at the same time destroys weeds.

Water should not be applied unless absolutely necessary, as watering encourages roots to grow near the surface, even when the ground is thoroughly saturated. When water is applied, the soil should be saturated for a goodly depth below the surface. For supporting Runner Beans stakes, wire-netting, twine, and twine-netting, are all useful, the choice depending on circumstances. The support should be secured firmly to stout poles at the end of the rows, and if necessary at intervals between, and they should be placed in position before planting the seedlings or sowing the seed.

—GARDENERS' CHRONICLE, Vol. LXV., No. 1690.

THE CULTIVATION OF THE POTATO.

Potato-growers will find a wealth of information in the Supplement* to the JOURNAL OF THE BOARD OF AGRICULTURE devoted to the "Cultivation, Composition and Diseases of the Potato."

The opening pages of the Supplement—a copy of which should be procured and perused by all gardeners—are devoted to a statement of the value of the potato as a food crop. It is pointed out that with the exception of the sugar beet, the potato stands first among food crops, in that it produces more human food per acre than any other crop. The recognition of this fact by Germany enabled that country to continue the war longer than would have otherwise been possible, and it is estimated that during the war the Potato formed from one-third to one-quarter of the diet of the German civilian population. In illustration of the importance attached by Germany to the potato crop, it is recorded that, before the war, of every 100 acres of cultivated land in Germany, 10 were under potatos, whereas in British cultivated land each 100 acres contained on the average only two acres of potatos.

The high food production of the potato may be judged by the following figures of the number of persons who may be supported by the produce of 100 acres :—

If the crop is used directly as human food, 100 acres of Potatos support 420 persons. If half is fed to pigs and half used for human food, 100 acres of potatos support 255 persons ; 100 acres of wheat support 230 persons; 100 acres of Barley support 180 persons; and 100 acres of medium grass, producing beef, support 15 persons. It is, moreover, an interesting fact that recent experiments have shown that the dietetic value of the potato is greater than was formerly supposed, for although the quantity of nitrogenous food substance which it contains is not great, the nutritive quality of the proteins of the potato is remarkably high.

The enhanced importance of the potato during the war led the Food (War) Committee of the Royal Society to undertake an investigation into the composition of British-grown potatos with respect to which there was but little data available. The analysis of many samples of potatos showed that there was a certain measure of variation in composition, and that of late varieties, Arran Chief and Evergood stood highest in nitrogen content and Up-To-Date, lowest. In early varieties, Great Scot is ahead of all others. A curious fact is brought out by the analysis of potatos grown in Eastern and Western Districts of England. In each variety (Arran Chief, King Edward VII., Great Scot and British Queen) the percentage of dry matter is higher and that of nitrogen lower in the Eastern-grown than in the Western-grown potato.

So much has been said recently in praise of the potato that it is as well to remember that there are certain disadvantages attaching to it, i.e., its bulkiness, lack of keeping quality, wastage in clamp and uncertainty owing to disease. As a set-off against these disadvantages, however, are to be mentioned its ease of cultivation, its suitability for growing in newly-broken up grass land and for planting near towns where sparrows take too heavy a

* JOURNAL OF THE BOARD OF AGRIC. Supplement, No. 18, March, 1919. 6*d* Post free.

toll of grain crops, and also its amenability to late planting. After balancing advantage and disadvantage, the Supplement concludes that the potato is the most valuable of all spring crops and a close second to autumn-sown wheat. The place of the potato in crop rotation is subject to no fixed rule. In the early districts of Ayrshire and Cornwall, potatos are grown in the same land year after year, but are followed by autumn catch-crops such as Broccoli, Rape or Italian Rye grass. In the Fen districts they may be planted every three years, or they may occupy a part of the root "break" and usually follow a corn crop. Although farmyard manure is generally applied to the potato crop, nevertheless good yields may be obtained by the use of artificials alone—e.g., 2 cwt. of sulphate of ammonia, 5 cwt. of superphosphate, and 2 cwt. of sulphate of potash.

With respect to varieties, the Supplement mentions favourably May Queen, Duke of York, Ninetyfold, Epicure, Sharp's Express and Eclipse among the first earlies; British Queen (although often very susceptible to blight), Great Scot, King George V, and Royal Kidney among second earlies; King Edward and Evergood as early maincrop varieties; Arran Chief (which though excellent in other respects is very susceptible to wart disease,) President (a disease-resistant variety, but susceptible to leaf curl and therefore not to be grown except with annual change of seed,) Up-to-Date, and similar varieties, Langworthy, Golden Wonder, and What's Wanted, Irish Queen, Lochar and Templar among maincrop (late) varieties.

Importance is properly attached to change of seed and to the use of Scotch and Irish seed, and records are given showing the advantage of new seed over once-grown and the yet smaller yield of twice-grown seed. Other subjects dealt with in the part of the Supplement, devoted to cultivation are storing and boxing seed, pitting or clamping, planting time, lifting and spraying.

The concluding part of the Supplement is devoted to diseases of potatos, but a consideration of this important subject must be deferred to a subsequent occasion. Enough has been said to justify the observations made at the commencement of this review, that this account of the potato should be studied by all those interested in its cultivation or use.—Gardeners' Chronicle, Vol. LXV, No. 1689.

THE FOOD VALUE OF PALMYRAH ROOTS.

The Acting Government Agricultural Chemist has furnished the following report on a sample of palmyrah roots sent him for analysis :—

"Palmyrah nuts are not edible in themselves, but on germination they throw out long fleshy roots which are edible and which are used as a source of food in Jaffna and elsewhere.

"From the analyses it will be noted that the edible portion forms a third of the whole nut, after four months germination ; 9-10 nuts produce about a lb. of edible matter from the roots. The Thavun (Tamil), Pelimadi (Sinhalese) amounts to 50% of the germinated nut and consists of sugar and starchy matter and is also edible so that from 9-10 nuts one gets about 2 lb. of edible matter.

"The edible portion of the roots is not highly nitrogenous and consists to a great extent of starches. The nutritive ratio is broad—the food units amount to 95."

RICE.

WORK ON RICE IN BURMA.

The Department of Agriculture, Burma, commenced investigations on rice about ten years ago. This was started by drawing up a rough botanical classification of the varieties of paddy grown. In 1911, a Bulletin was issued on this subject.

It was not till after 1911 that the improvement of varieties was taken up. As a working basis the botanical classification had to be modified. A standard collection was made for reference purposes, and classified on the basis of their more important botanical and agricultural characters.

Improvement by selecting the best pure lines was started at Mandalay. This is in Upper Burma, where paddy has to be irrigated and the climate is dry.

Later about 1914, an agricultural station for rice was established at Hmawbi in Lower Burma, here paddy is rain-fed, the rainfall being heavy and the atmosphere moist.

It was found that, unlike Indian wheat, no one improved variety selected from one station like Mandalay was suitable for universal distribution.

The varieties successful in Upper Burma were found unsuited for Lower Burma.

Experimental and improvement work with rice was found to be a very complicated matter with many difficulties and problems.

In 1916 the selection work had reached such a stage as to permit the distribution of improved strains of seed in large quantities. Over 100 tons of improved seed was distributed from Hmawbi, and a like amount was available for distribution from Mandalay.

But the Department must have met with a severe set-back, as nearly all the seed distributed from Hmawbi failed to germinate.

It was felt that careful distribution of seed from one centre was a matter of some difficulty. Investigations showed that in some varieties, machine-threshing had appreciably lowered the germinating capacity, but that the main cause of the failure was the damage caused during transport from the station to the purchasers' villages. The distances being long and the alternate wetting and drying, the seed must have got in transit having caused the damage.

The multiplication of seed-farms and seed-growers was indicated as the solution to the problem.

"District farms are intended: (1) to test improved varieties from the main stations for suitability to local conditions. (2) to serve as depôts for seed and implements for the district agriculturists.

"They are not seed farms in the sense that they produce and distribute large quantities of seed. Such distribution is done from them cautiously and, as far as possible, multiplication is done by private cultivators after the seed has been proved to be suitable for their particular localities." (ANN. REP. 1918.)

At the present time the Experiment Stations must be turning out annually something like 200 tons, if not over, of improved seed, giving an increased yield of 15 to 30% over the ordinary seed sown by cultivators.

THE MANDALAY EXPERIMENT STATION.

This Station was established in 1907, and is some 430 acres in extent. All of this, however, is not under paddy. The soil is a stiff impervious clay

which absorbs moisture very slowly, and the heavy rains at times cause serious flooding. The rainfall averages about 32·5 inches, but is very badly distributed.

The rices first experimented with, were those exported by the millers to Europe.

According to the seasons of growth, there are four principal classes of rice grown in Burma. (I) Early paddy (*Kankyin*) sown about June and harvested in October—the "autumn rice." (II) The "winter rice" (*Kankgyi*) sown in July to September and harvested from early in December to end of January. This is the principal crop, and is computed to occupy 95 % (i.e. more than 9½ million acres) of the total area under paddy in Burma. It is practically the only source of export of paddy and rice. The Mandalay experiments were made on this crop.

The other two classes of rice are generally grown round the edges of lakes where they are commonly sown broadcast or on fields, where the water recedes or dries up during the hot weather. (III) *Mayin* paddy is sown in December and January and harvested in May to June. This crop is of some importance occupying an area of about 90,000 acres. (IV) *Kankli* paddy usually broadcasted about March to April and reaped in June to July. This crop is of least importance.*

Owing to the condition of the rice trade and the consequent indifference of millers towards quality, the main consideration in improvement was that of yield, and the points given special attention were : (1) the number of grains per plant ; (2) the variations in weight of grain ; and (3) the tillering power.

It was found that "the yielders of the heaviest weight of grain per acre do not by any means always produce the heaviest seed." In breeding high-yielding strains, it was found that selecting a plant that tillers excessively is not the best thing. "As the number of tillers increases, the average yield per tiller decreases." This is a circumstance affected considerably by the space allowed for each plant, the fertility of the soil and such like environmental factors.

Another source of much trouble was the appearance of plants, producing red grains in crops of white-grained varieties. This was proved as due to hybridisation. "Whiteness and redness of glumes were found to act as a pair of simple Mendelian characters, the former being dominant" and similarly, whiteness and redness of grain, in which case the latter is the dominant character. This formed the basis of a method of eliminating red grains from pure lines.

Of the improved strains, *Ngasein* 2,104 is the one now distributed largely. For 1918 it is calculated that over 20,000 acres in Kyankse and Mandalay districts was put under this improved strain. In the Shwebo district, the millers cater for local consumption. This variety is therefore not so popular as other varieties used more for local consumption.

Investigations are now directed towards the improvement of varieties not exported, but consumed locally.

The method adopted is to get seven varieties from each Co-operative Society, improvement of which is desired. This work is still in the experimental stage, but the final result of the selections will be available shortly.

Work is also being continued with the object of getting strains that mature early and also yield heavily. This is done with artificially-crossed hybrids and certain introduced Japanese varieties.

The other work done on which some conclusions have been arrived at are the manurial experiments. These may be summarised as follows :— (ANN. REPORT, 1917.)

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*This and what follows from THOMPSTONE'S *Upper Burma Irrigated Paddy*. AGRI. JOURN. IND. Vol. X. Pt. I, Jany., 1915.

(1) Bulky organic manures give large increases of yield and of profits.

Cattle manure alone, even one small application—produces a heavy increase in out-turn and in profits. The yield increases with every additional quantity applied, though in diminishing proportion.

The only oil-cake tried was cotton seed cake. This gave good yields, but the profits are in every case consumed by the cost of the manure.

(2) *Cattle manure with Phosphatic manures.*

(a) Cattle manure 4,940 lb. and Superphosphate 104 lb. per acre gave increased yields with a nett profit of Rs. 24 per acre or Rs. 21 without the straw.

(b) Cattle manure 4,940 lb. and Bone Phosphate (rate of 20 lb. P^2O^5 per acre) gave yields with a nett profit of about Rs. 21·50 per acre.

In both cases, it was observed that the proportion of straw to grain is considerably lower from the plots receiving phosphates than from those receiving cattle manure alone.

(c) With potassium sulphate added, the yields were reduced. Potash, it would appear depresses the yield in these soils.

(3) Phosphatic manures alone gave profitable yields of grain. This is estimated at an average of Rs. 18 per acre. Superphosphates (104 lb. P_2O per acre) being better than Bone Phosphates.

(4) Complete manure mixtures gave heavy out-turns, but the profits have been consumed by the high cost of manures, particularly of Ammonium sulphate and potassium sulphate.

Artificial manures do not pay their application. Nitrolim gives conflicting results. Potash depresses yields. Ammonium sulphate gives but a little increase at a heavy loss. The effect of lime is very small and can only be applied at a loss.

(5) Burnt paddy husk gives very good results due no doubt to the physical action on the heavy clay soils. It is recommended that this waste product from mills would pay their transport and application to heavy soils at the rate of about 12,000 lb. per acre.

(6) Green manures have not been a success. They can with difficulty be made to thrive on the land. They often cause a reduction in yield. It is probable that this is due to the fact that the soils are badly drained.

(7) The effect of cattle manure and phosphates appears to be greater in unfavourable seasons.

THE HMAWBI EXPERIMENT STATION.

This Station consists of about 424 acres of land of which 165 have been laid out under crops.

The rainfall is about 95 inches fairly satisfactorily distributed and rice is not irrigated.

The main object of the selection is: (1) "The selection and propagation of commercial types suitable for the European market in white rice. (2) Selection and propagation of types suitable for use as table rice locally and in the Eastern market. (3) Selection and propagation of the finer types of rice such as constitute the *riz-de-luxe* of the European trade with a view to the possible future extension of this trade in Burma." (Annual Report 1917.)

The-last mentioned work is done in co-operation with the Imperial Institute. It is felt, however, that any attempt to produce fine rice in Burma for the European market would have to be on a small scale and in particular localities. If produced on a large scale, the price would drop as the demand in Europe is small for this type of rice.

With regard to (2) the table rice used locally is of a large bold chalky grained type known as *Kankgyi* bazaar rice. The demand for this is also small.

The work that is by far the most important is on (1). Europe will take large quantities of a rice that is hard pearly and full-grained, known in Burma as the *Ngasein* type. A selected strain Ngasein 10 is the most promising and is said to yield "3,500 lb. per acre on a field area of 17 acres, while unselected *Ngasein* gave only 2,200 lb. The variety is now under distribution."

Another line of work undertaken is the trial of hybrids raised by crossing the Burmese *Letywezim* with an imported Java plant in the hope of finding a quick-growing strain suitable for the higher lands which do not retain water well. Soil acidity as a limiting factor in paddy soils of this tract is being investigated by the Agricultural Chemist. The manurial experiments which have gone on for five years at this Station strikingly confirm the Mandalay results. Cattle manure applied at the rate of 50 lb. N. per acre gave an increase of 63 % over the unmanured crop. As an outcome of the disastrous failure to germinate, some selected seed distributed from Hmawbi, an extensive series of germination trials were made in 1918. Germination tests were made to determine the comparative merits of different methods of storage. The paddy which is machine-threshed is stored in gunny bags arranged in piles, two bags deep, with a free space between each pair of piles. The bags rest on a platform of two wooden beams so as to give free circulation of air between the bags and the floor. The godowns are of corrugated iron walls and roof and the floor of concrete. It was found that this method of storage is satisfactory.

If bags are allowed to be on the floor for several months, a certain amount of the grain is found to germinate. It is still worse if the grain is stored in heaps on the floor.

The threshing-machine specially built for rice work by MESSRS. RANSOME, SIMS & JEFFRIES has now been found to impair the germinating power of the grain, and the use of this machine for seed-paddy is now discontinued.

With reference to the scientific work done in Burma, the caution advised by the Revenue Secretary and the future progress of the Department, the following paragraph is worth quoting to be pondered over in Ceylon :—

"Advance by trial and error on experimental farms, followed by demonstration of successes in the villages is the only safe method, but the experiments must be well chosen, not too numerous, and closely supervised, or else inaccurate results may be prematurely demonstrated with unfortunate consequences. The greatest asset to be secured is the confidence of the cultivators in the wisdom and ability of the Officers of the Department. Once this is gained, the Burman cultivator should progress far more rapidly than his Indian brother, since he is far more ready to learn new methods, and quicker to appreciate the advantages of selected seed, new varieties of crops, and more economical methods of farming.

"But Burma is at least fifteen years behind some of the Indian Provinces in the development of its agricultural services, and unfortunately agricultural improvement is limited by nature, while new seed and new methods are being tested season by season ; great patience is therefore necessary. Hasty conclusions, too prematurely recommended to cultivators, may do most serious harm to the success of the Department's work by introducing distrust, when confidence is the one thing needful. The people of Burma must be content with slow progress, in the full confidence that the local Government is fully alive to the imperative necessity of making up for lost time, so far as circumstances permit. The annual expenditure on the Department is now about 2½ lakhs ; the Lieutenant Governor hopes to work up to 12½ lakhs, or five times that amount, in as short a period as the engagement of qualified experts, the establishment of farms, and the training of Burmans will permit."—(ANNUAL REPORT 1918).

H. L. VAN BUUREN.

SEED-SELECTION IN PADDY CULTIVATION.

C. DRIEBERG, *Secretary, C.A.S.*

Seed-selection in paddy cultivation is as important as seed-selection in the case of any other plant, if we are to expect good crops.

Tea, rubber and coconut planters know this, and are careful to use only the best seed they can get.

In Western countries, the greatest care has long been taken in selecting the seed of cereal crops (wheat, etc.,) for purposes of propagation. In the East, Japan and India are giving much attention to this matter.

The principle upon which seed-selection is founded is one that will commend itself to every one. It is that the offspring of strong healthy parents will grow up into strong healthy individuals themselves. In the same way the seeds from good plants are likely to produce good plants themselves.

In the case of paddy, the first thing to do is to fix upon those plants which are as nearly as possible perfect.

This must be done in the field, and the cultivator must periodically walk through them and carefully examine the growing plants.

In doing so he will observe that there are some plants which started well and have grown into robust specimens which freely tiller, that is, produce a number of side-shoots so that the plant becomes bushy. Remember that every new shoot means an extra ear of paddy.

The next point to make sure of is that these well-grown plants yield good heads of grain.

It is, sometimes, thought desirable to mark these plants in the field by means of a strip of red or white cloth ; but this is a matter that might be left to the discretion of the cultivator.

The seed on these plants must be allowed to fully ripen before the plants are cut and removed, and this must be done as a special operation distinct from the general harvest.

After the grain has been threshed out from these specially-harvested plants, the selection of the seed itself has to be done. All the seed produced by a plant is not of the same quality. Some will be better than the rest, and it is necessary, therefore, to select only the best seed, viz., seed that is sound and well-developed—plump and heavy.

This can be done first by winnowing to get rid of the "lights," and next running through the mass of seed, making an examination by hand and eyes so as to be able to pick out and reject undesirable seeds.

Undesirable seeds should on no account be used for sowing, since seeds that are not properly developed are not likely to produce heavy-yielding plants.

In Japan, the selection of seed is done by immersing the seed in a saturated solution of salt, that is in water which has dissolved out and contains as much salt as it possibly can.

It is, however, a somewhat tedious process, and it will suffice if the instructions given in this leaflet are carried out.

Now if selection is regularly carried out, the result will inevitably be that the quality of the paddy will improve year by year, and this, of course, means that the yield will be greater at every harvest.

As a result there will be more rice produced in the country, and we shall be less dependent on outside sources.

Now this is the chief aim of the Food Production Committees, and if you practice seed-selection in paddy cultivation you will, while benefiting yourselves, be increasing the locally-produced supply of food.

CEYLON AGRICULTURE.

ANNUAL REPORT OF THE MATALE FOOD PRODUCTION SOCIETY.

The Society was inaugurated in November 1917, at the original instance of the three Matale Members of the Board of Agriculture—Messrs. Senior-White, Thomson and Daniel Joseph, under the Chairmanship of the Acting Assistant Government Agent, Mr. E. F. Marshall, and the Joint Hony. Secretaryship of Messrs. Senior-White and Thomson.

The reason for the formation of the Society was that it was considered to be the most suitable means of acting upon the circular issued by the Director of Agriculture to members of his Board in which he impressed upon them the necessity for increasing the food production of Ceylon. The objects of the Society have been to try and raise the food production of the Matale district by teaching the population the correct methods of cultivation, influencing them to cultivate more of their available land, helping them to procure seed and to settle their difficulties, and encouraging them by the holding of local agricultural shows.

At the start a General Committee was elected and local village Committees were formed, but it was found later that the General Committee was unwieldy, and that few of its members attended the meetings regularly, so an Executive Committee for routine purposes was elected. It was also soon found that the local village Committees, with the exception of Rattota, which was kept going by the energy of Dr. Dhanapala, gradually ceased to do anything and became useless and, later, defunct.

The work has been organised as follows :—

(1) A census of all lands, other than paddy lands, under cultivation with foodstuffs, and of all uncultivated, but available lands, was taken together with the owner's and cultivator's names, and the number of persons depending upon the latter. By this means, it was found that a large amount of useful land claimed as private, in extent 869 acres, in Matale East and South, was available for increase of cultivation. Of this total, 319 acres in near proximity to villages have been cultivated this year, and in spite of all the Society's efforts, 550 acres are lying idle.

(2) To get the available lands under cultivation and to improve the cultivation of the already cultivated lands, the services of Mr. A. Madanayake, Agricultural Instructor, were placed at the disposal of the Society by the Ceylon Agricultural Society at the former's request, and later, by private grant, Mr. V. G. Perera, late Student of the Peradeniya School of Tropical Agriculture, was engaged to assist Mr. Madanayake.

The Instructors and Members of the Executive Committee have regularly visited cultivated lands, and have been the means of encouraging the villager, instructing him in his methods of cultivation, and arranging for the distribution of seed through the Headmen.

(3) To inaugurate Village Shows.

Three Shows were held at Matale, Rattota and Paldeniya respectively. [For reports on these Shows, see "Tropical Agriculturist" for March and April.—Ed. "T. A."]

Weather conditions and sickness put great difficulties in the way, but on the whole the Shows proved successful. Money for prizes and expenses was collected by subscription, and almost the whole amount was found by the

Official element and the Planters. It was most disappointing to see the lack of public spirit generally displayed by the well-to-do mercantile section of the community in refusing pecuniary assistance, though standing to benefit directly by the results of the Society's efforts. The medals in the paddy field section were provided by the Ceylon Agricultural Society. The quality of the exhibits was good, even if the quantity was small.

The special features of the Shows were, the allotting of prizes for garden and paddy *cultivation*, marks being given during the growing period, and the holding of the Shows purely as village ones, without the ostentation of outside exhibits and lavish display. These features put the villager more at his ease and are a more direct incentive to individual village effort. The attendance of the real village element at the Shows was noticeable.

In addition to the above, other important works have been looked into and are in train :—

(1) A few of the school gardens have been supervised, and extra land leased at the Society's expense for Kaikawella School. An experimental garden has been started in the Saxton Park, showing a system of crop rotation under normal conditions, and plants and seed from this will be available for improving the jât of local products. The thanks of the Society are due to the Friends' Mission for their help, especially with regard to their Weragama School, to the Ceylon Agricultural Society for a grant towards the upkeep of the Saxton Park garden, and to the Asst. Government Agent for a further grant on this account.

(2) An anicut has been arranged for at Nikawella, enabling 80 acres of abandoned paddy land to come back to cultivation ; and a block of ten acres at Raitalawella has been planted in beans and maize which was lying idle for 15 years through lack of knowledge and enterprise.

A system for helping the villager to market his produce by securing some stalls in the market was attempted by certain members of the Society in a private capacity, but it was found that the Market Traders' ring was too strong and some Rs. 300 was lost over the venture. However, this incursion in market matters had the effect of curtailing the power of the ring that dominated the market, a monopoly scandal was exposed and licenses have since been granted for the outside sale of produce.

There is little doubt that the Society has been of considerable use to the villagers by collecting knowledge as to their wants and hardships, and passing it on to the proper sources of remedy, as also by the inspection of paddy fields, *Vel-Muladeniyas* being supervised, with the consequence that signs of better work can be seen, though there is still hardly more than a beginning made.

It has not been found possible, owing to lack of Instructors, to carry the work far out from Matale Town, and a nominal radius from this point of five miles has been worked, and to this area alone the figures apply ; but a good deal of paddy land inspection further out has been undertaken.

Seven General and eight Executive Committee Meetings have been held between November 1917 and March 1919. Correspondence has amounted in the same time to 387 letters inwards and 251 outwards.

The Society may congratulate itself on being the forerunner of the Food Production Committees, now called into being by Government throughout the Colony, and with the inauguration of one such in Matale the *raison d'être* of the Society's existence no longer remains—but it is hoped that all members will continue to assist the Committee by every means in their power.

ALLEN B. THOMSON,
RONALD A. SENIOR-WHITE,
Joint Hony. Secretaries.

MATALE FOOD PRODUCTION SOCIETY.

Revenue and Expenditure Accounts from November, 1917 to May, 1919.

	Rs.	Cts.		Rs.	Cts.
To Rail freight and cart hire on seed	3	30	By Discount	6	46
,, Stationery	62	62	,, Subscription	240	00
,, Postage	25	41			
,, Commission (Rs. 16·10) and Cheque Book (Re. 1·50)	17	60			
,, Printing Notices	10	25			
,, Asst. Agric. Instructor's 2 months' salary @ Rs. 25	50	00			
,, 2 years' lease on Kaikawella land @ Rs. 15	30	00			
,, 1st year clearing Kaikawella School Garden	13	00			
,, Excess Expenditure on Saxton Park	32	27			
,, Balance	2	01			
Rs.	246	46	Rs.	246	46

SAXTON PARK DEMONSTRATION GARDEN.

	Rs.	Cts.		Rs.	Cts.
To 8½ months' wages @ Rs. 17·50	148	75	By C. A. S. Moiety	130	00
,, Cash Payment (Labour)	40	22	,, Gansabhawa Moiety	85	00
,, A. I. for casual labour	15	00	,, Cattle trespass fine	9	00
,, 16 Loads Manure	8	00	,, Matale Food Production Society	32	27
,, Tools	42	75			
,, Baskets and Sticks		55			
,, Rent to Local Board	1	00			
Rs.	256	27	Rs.	256	27

BALANCE SHEET.

Liabilities.

	Rs.	Cts.
Matale Food Production Society A/c	2	01
Shows A/c	389	04
Rs.	391	05

Assets.

	Rs.	Cts.
Mercantile Bank of India	129	90
Kachcheri	230	95
Cash A/c		20
Ceylon Agricultural Society	30	00
Rs.	391	05

SHOWS A/C.

Expenditure.

	Rs.	Cts.
To Commission on Cheques	1	51
,, Batta for carrying subscription list	2	50
,, Printing Notices	63	70
,, ,, Prize Certificate	13	50
,, Engraving Medals	16	05
,, Translating lists	1	00
,, Asst. A. I. Paldeniya Show	2	50
,, 23 Coolies @ Cts. 60	13	80
,, Refreshments at Shows	38	35
,, Asst. A. I Batta to Paldeniya and Rattota Shows	17	50
,, Prize money	550	00
,, Balance, being excess of Income over Expenditure	389	04
Rs.	1,109	45

Revenue.

	Rs.	Cts.
By Subscription	1,109	45
Rs.	1,109	45

MINUTES OF FOOD PRODUCTION COMMITTEE MEETINGS.

KALUTARA.

Minutes of a Meeting of the Food Production Committee of the Kalutara District held at the Kalutara Kachcheri on the 24th March, 1919.

Present.—Mr. C. V. Brayne, A.G.A., Kalutara (Chairman); Mr. S. C. Felsinger, Sub-Divisional Officer (Forest Department); Messrs. J. A. Weerasinha, Mudaliyar, Rayigam Korale; F. D. Samarasinghe, Mudaliyar, P.K. East; D. T. Perera, Mudaliyar, P K. West; Edmund Pieris, Totamune Mudaliyar: A. H. Wijesekera (P.K. East); W. N. Goonewardena (P.K. West), Cecil Tillekeratne (R.K.), and M. Amarasinghe, Agricultural Instructor, W.P.

The Chairman explained to the Committee the circumstances under which the meeting was called, and the object for which the Committee has been called into existence.

The Committee first considered the steps to be taken to increase the food production on private lands. The figures prepared by the Mudaliyars of the private lands which could be cultivated but are not, were considered. They amount in the district to about 1,000 acres. A village rule for compelling small private owners to cultivate their lands was considered. The Committee was unanimously in favour of such a rule being passed. The rule is as follows :—

"Whenever it shall appear to the Village Committee that any garden, owita land, or paddy land is allowed to remain uncultivated or that it is insufficiently cultivated or that it is kept in a neglected state, the Village Committee is empowered to issue a notice on the owner or owners of such garden or land upon a given date to show cause to such Committee, why an order should not be made that such owner or owners shall bring such garden or land under proper cultivation within such period as the Village Committee shall determine. Upon the failure of such owner or owners to attend upon such date or to show sufficient cause to the contrary, the Committee is empowered to make such order. Any person failing to comply with such order by a Village Committee shall be guilty of an offence.

"Provided that any person dissatisfied with any such order by a Village Committee may within 14 days appeal against it to the Assistant Government Agent whose decision shall be final."

The Committee further recommends the clearing by Government at a cost not to exceed Rs. 3,000 of two *elas*, Dummalamodera ela and Kaluwila-ganga in the Kalutara Totamune. These *elas* to be kept cleared hereafter by the landowners. Clearing of these two *elas* will bring about 1,000 acres under cultivation.

The Committee considered the question of markets for the villagers' produce, and is of opinion that it would be a good thing to foster a trade in chena produce, and especially hill paddy between the interior villagers and the coast. Also that Sunday markets be encouraged by the Village Committees.

The Committee considered the steps that it advises be taken with regard to food production on Crown lands.

It recommended that the clearing in the jungle villages in the East and South-East of the district should be regularised, areas being marked out by the Mudaliyar and the Forest Officer, and given for periods of two or three years on condition that the lands are re-afforested under the supervision of the Forest Department. Care must also be taken that this chena cultivation does not interfere with the wet cultivation of paddy. The Agricultural Department would also be asked to supervise and try and improve the method of cultivation and introduce as far as possible a rotation of crops.

The Committee recommended that the special leases for the production of foodstuffs be modified (1) by making them perpetual, subject to the faithful fulfilment of the terms by the lessee; (2) by allowing him to plant a portion of the land not more than half with jak, coconut and such other permanent cultivation as may be approved by the Assistant Government Agent.

Further that small areas of Crown lands which are not required for reserved forest, village forest, or other Government purposes, should be utilised for such special leases, and that leases be given in anticipation of survey, the blocks being marked out by the Mudaliyar and the Forest Officer, due care being taken to leave the necessary reservations.

The Committee considered and adopted the proposal put forward in paras 2, 3, 4 and 5 of the Assistant Government Agent's letter No. 35 of 11th January, 1919, to the Hon'ble the Government Agent, W.P.

The Committee recommended that if it is practicable, the hundred acres or so mentioned in para 7 of the Assistant Government Agent's letter No. 35 be made available for paddy cultivation. The Forest Department will of course have to be consulted first.

C. V. BRAYNE,
Chairman.

KURUNEGALA.

Proceedings of a Meeting of the Provincial Food Production Committee, North-Western Province, held at Kurunegala Kachcheri on 29th March, 1919.

Present,—Messrs. C. R. Cumberland, Government Agent, N.-W.P., President; B. G. Meaden, D.I.E.; Assistant Government Agent, Puttalam and Chilaw; C. Drieberg, Secretary, C. A. S. & Supdt., L. C. P., Hon'ble Mr. T. B. L. Moonemale, Messrs. G. E. Madawela, Proctor; J. G. Tennekoon, R.M, Hiriyala Hat-Pattu; J. R. Nugawela, Agricultural Instructor; and Mudaliyar P. A. C. Ekneligoda (Secretary).

Read and confirmed minutes of meeting held on 22nd February, 1919.

Read letter from Divisional Irrigation Engineer regarding short cultivation for *Maha* under Wani tanks, and suggesting every effort be made to get the whole acreage cultivated for *Yala*.

Resolved that this should be done and that a circular be sent to all the Ratemahatmeyas requesting them to impress upon all Vel-Vidanes, the urgent

necessity of getting all land possible cultivated, and of enforcing the rule as to prosecution of defaulters.

Other Foodstuffs.—It was agreed that free chenas be allowed on the understanding that a simple rotation of cereals and legumes be made for three years.

Discussed also the question of allotments of land for cultivation of vegetables, chillies, onions, etc., near bazaars, towns and villages.—Resolved that they should be encouraged.

C. R. CUMBERLAND,
President.

NUWARA ELIYA.

Minutes of a Meeting of the Food Production Committee held at Nuwara Eliya, on 5th April, 1919.

Present.—Messrs. M. M. Wedderburn, A. G. A. (Chairman), B. G. Meaden, Divisional Irrigation Engineer, C. D.; R. M. White, Assistant Conservator of Forests, Nuwara Eliya; K. B. Welagedara, R.M., Kotmale; E. F. Edrisinghe, Gravets Mudaliyar and J. P., Nuwara Eliya; P. B. Girihagama, President V. T., Uda-Hewaheta and Walapane; and P. B. Kapuwatte, Agricultural Instructor, Harasbedda.

Constitution of the Committee.—Resolved that the Committee consist of the Assistant Government Agent, N. Eliya, (Chairman); Director of Agriculture and Secretary, C. A. S. & Supdt., L. C. P. (*ex-officio* Members):—The Divisional Irrigation Engineer, C. D.; the Assistant Conservator of Forests, Nuwara Eliya; the Gravets Mudaliyar, Nuwara Eliya; the Ratemahatmeyas of Uda-Hewaheta, Kotmale and Walapane, the President V.T., Uda-Hewaheta and Walapane, Messrs. C. C. Wilson of Diyanillakele and Gordon Adams-Williams of Galaha.

Resolved that Mr. J. A. Girihagama, President V.T., Uda-Hewaheta and Walapane be appointed as Hony. Secretary & Treasurer.

Resolved that Committee meetings be held at Nuwara Eliya, at 10 a.m. on fourth Wednesday, in March, June, September and December every year.

Business—3 members to form a quorum.

Resolved that quarterly reports of Agricultural Instructor's work be submitted in future for consideration at the meeting.

Resolved that the minutes of the meeting be recorded and that all moneys be placed in deposit at the Post Office Savings Bank.

Village Show. — Resolved that the Ratemahatmaya of Kotmale be requested to make arrangements for holding a Village Show in December, 1919, Uda Hewaheta in May 1920 and Walapane in 1921. The Agricultural Department will be asked to vote Rs. 75 for each Show and the Ratemahatmayas will make timely application to the Nuwara Eliya Agricultural Show Committee if they want additional grants.

Experimental Fields.—Resolved to open Experimental Fields in triple plots (a) indicating cultivation by ordinary sowing of paddy, (b) by transplanting, (c) by manuring and transplanting at Maswela in Kotmale, Dehipe

in Uda Hewaheta and Thibbotugoda and Ambanella in Walapane, with an extent of not less than half-an-acre with a plot of exact size and condition side by side and that the Ratemahatmayas make arrangements for land work, and bear the cost. The Agricultural Instructor to supervise and advise the Ratemahatmayas, who should submit progress reports at the next meeting.

Extension of Paddy Cultivation.—Resolved to urge on Government to undertake the extension of Waduwawela Ela.

Resolved that the Government be asked to sanction the complete restoration of Bodi Ela as this work will irrigate at least 1,000 acres.

Resolved that the Government be asked to sanction the extension of Serupitiye Ela and Lemasuriyagama Ela.

Experimental Stations.— Resolved that no Experimental Station be undertaken in villages at present.

Resolved that it is not practicable at present to frame a rule to make each villager cultivate a garden.

School Gardens. — Resolved that the Ratemahatmayas be asked to encourage school children to have garden plots of their own.

Co-operative Credit Societies.—Resolved that the Ratemahatmaya of Kotmale be instructed to hold a meeting at the proposed Village Show for the formation of a Co-operative Credit Society.

Pelwaditenne Scheme.—Resolved to ask the Assistant Conservator of Forests to report on the proposal to lease about 20 to 30 acres of land around Pelwaditenne Ambalama as a Village settlement. One acre for each family to be given on terms similar to Blackpool lands.

Cultivation of Chena Lands. — Resolved that each Ratemahatmaya should select Chena Lands and recommend the names of a few suitable families to be given 6-acre blocks demarcated by the Ratemahatmaya and Agricultural Instructor on condition (a) that they live on the land, (b) no rent to be charged for the first three years, (c) timber for houses to be given free, (d) approved crops to be planted in rotation (the land to be divided into three parts, i e., half-an acre for the house and some permanent plantation, i.e., plantains, drumsticks, etc., and the remaining $5\frac{1}{2}$ acres to be divided, half the land to be planted with 3-yearly rotation crops, while the remaining land was idle, and at the expiration of 3 years the portion planted to remain idle while the other portion was planted up.

Appointment of a Chena Muhandiram.—Resolved to urge on Government the necessity for the appointment of a Chena Muhandiram if an improvement of Chena cultivation is to be shown.

M. M. WEDDERBURN,
Chairman.

MATALE.

Minutes of a Meeting of the Matale Food Production Committee held at Matale Kachcheri at 2 p.m., on April 16th, 1919.

Present :—The Assistant Government Agent, Matale (in chair); Messrs. A. B. Thomson, C. P. Anderson and J. Barber, the Agricultural Instructor, the Asst. Agricultural Instructor and the Ratemahatmaya of Matale East and Mr. R. A. Senior-White (Honorary Secretary).

Minutes of last meeting taken as read and confirmed.

A. I's programmes and reports read and passed. A. G. A. takes up with slack V. M. Ds.

Read letter from Director of Agriculture re publishing Minutes of the Committee's Meetings.

Read letter from Director of Agriculture re estimates for season, Ratemahatmaya North and MR. BARBER to confer re a site for the Paldeniya Experimental plot. Hon. Secy. to report at next Meeting on his ideas for location of the new A. A. Is.

Ratemahatmaya East reported re the Nikawella anicut scheme. I. S. I. to re-align channel.

Ratemahatmaya North wrote re the Pelwehera scheme and is to report finally at next Meeting.

MR. A. B. THOMSON advocated pressure re planting maize and dry beans in lieu of ordinary vegetables on gardens as apart from chenas and a long discussion followed—the outcome of which was to ask A. Is. and R. Ms. to push this.

Minutes of a Meeting of the Matale Food Production Committee held at Matale Kachcheri at 2 p.m. on May 21st, 1919.

Present :—The Assistant Government Agent, Matale (in chair); Mr. A. B. Thomson, Mr. C. P. Thompson, the Ratemahatmayas of Matale South and East, the Agricultural Instructor, the Asst. Agricultural Instructor and Mr. R. A. Senior-White (Honorary Secretary).

June touring Programmes.—Considered and passed.

April touring reports.—Discussed. A. G. A. takes up certain matters needing his attention with regard to irrigation.

Location of new Instructors.—Considered Hony. Secy's report re this. After some discussion it was decided to locate the four for the southern area at Matale—Chief Instructor with assistants at Ukuwela, Kaikawella and Maningomuwa, and for the Northern area (when provided) at Galewela, Dambulla, Kongahawela and Pallegama. Their sub-areas to be as in Hony. Secy's reports.

Chena Experimental Plot.—Read report from Ratemahatmaya, North, that he and MR. BARBER had been unable to find a suitable site at Paldeniya and had selected 3 acres at Maningomuwa.

MR. A. B. THOMSON was deputed to inspect the site as soon as possible, when work would be commenced.

Pelwehera Tank.—Read report from Ratemahatmaya, North, that the owners of the undeveloped land under this tank were now prepared to pay for channels and high level sluice by annual instalments. Irrigation Department advised.

Kaikawella School Garden.—Read letter from Moor care-taker of this land that he was prepared to renew the lease for another year. Matter handed to Ratemahatmaya, East, to complete.

Nikawella Scheme.—Submitted list of villagers prepared to cultivate the Walauwe lands. Ratemahatmaya South to obtain Asgiri Korala's signature in assent. Timber permit for anicut granted.

Bowelenne Scheme.—A. G. A. announced that he had definitely put this up to the Irrigation Department. It was hoped to irrigate 1,000 acres.

R. A. SENIOR-WHITE,
Hony. Secy.

HAMBANTOTA.

Minutes of a Meeting of the Food Production Committee, Hambantota District, held at the Tangalle Resthouse, at 3-30 p.m., on Saturday, the 26th April, 1919.

Present:—The Assistant Government Agent, Hambantota (Chairman); Rev. Father P. Cooreman, S.J.; Mudaliyars West Giruwu Pattu, East Giruwa Pattu and Magam Pattu, Mudaliyar B. J. H. Bahar, Mr. V. S. Wickramanayake and Kachcheri Mudaliyar, Hambantota (Hony. Secretary).

Minutes of the previous Meeting held on 18th February, 1919, were confirmed.

It was decided to have an Agricultural Show at Tangalle for the Giruwa Pattus on the 25th and 26th July, 1919, with special prizes for Magam Pattu, and to have a Show for Magam Pattu in February, 1920, at Tissa or Hambantota, place to be decided later.

The following working Committee were appointed for the purpose :—

For the Giruwa Pattus.—The District Judge, Tangalle ; the Divisional Irrigation Engineer, Tangalle ; Messrs. E. G. Auwardt, V. S. Wickramanayake, Mudaliyar, West Giruwa Pattu ; Mudaliyar, East Giruwa Pattu ; Muhandiram, West Giruwa Pattu; Chena Muhandiram, Hambantota District ; and President, V. T. West Giruwa Pattu.

For Magam Pattu.—Rev. Father P. Cooreman, S.J. ; the Office Assistant to the Asst. Government Agent; Mudaliyar B. J. H. Bahar; Mudaliyar, Magam Pattu; Muhandiram, Magam Pattu ; Messrs. E. T. Abenayake and J. A. Amarasinghe.

It was decided that each member should be given a subscription list for raising funds to meet the necessary expenditure.

W. L. MURPHY,
Chairman, Hambantota District
Food Production Committee.

KEGALLA.

Minutes of Meeting of the Food Production Committee held at the Kachcheri, Kegalla, on 15th May, 1919.

Present.—The Assistant Government Agent (in the chair), Messrs. L. B. Nugawela, H. W. Boyagoda and J. H. Meedeniya Ratemahatmayas, Mr. L. B. Dodanwala Korala, Messrs. Charles Brereton, C. Drieberg, A. A. Wickramasingha, R. P. Seneviratna and A. E. Barrs.

1. Minutes of the previous Meeting read and confirmed.

2. The report of the Agricultural Instructor not having been received for the past month, the Agricultural Instructor gave a verbal report of work done more particularly in connection with demonstrations of use of the Goiya plough.

3. Submitted programme of Agricultural Instructor for June. MR. BRERETON kindly undertook to be present at the demonstration in the Kelani Valley and to obtain the presence of some other planters.

4. MR. BRERETON brought to the notice of the Committee that considerable areas of private lands have been cleared of fuel and are available for food stuff cultivation.

Resolved that the co-operation of the Committee of the Western Province be asked for in securing Food cultivation on these lands and that Agricultural Instructor, Kegalla, give his attention to the matter.

5. As regards garden competition it was resolved that all intending competitors send in their names to the Ratemahatmayas before 30th June, and that judging takes place in July and August.

6. Resolved that all the Ratemahatmayas be asked to utilize their Division Days in explaining to the people the necessity of planting yams and other food stuffs. Presidents V. T. might do similarly in their Courts.

7. Resolved that a Sub-committee consisting of the Chairman, Hony. Secretary and MR. WICKRAMASINGHA be formed to draft a scheme for holding village Shows.

8. To order a supply of vegetable seeds on V. C. account.

9. To fix the next Meeting for 2nd Thursday in July, at 10 a.m.

JAFFNA.

Minutes of a Meeting of the Jaffna Food Production Committee held at the Jaffna Kachcheri at 3-30 p.m, on Thursday, May 15, 1919

Present.—B. Constantine, G. A., N. P. (in the chair); Hon. Sir A. Kanagasabai, Hon. Mr. A. Sapapathy, Messrs. M. S. Ramalinga, Mudaliyar; C. M. Sinnaiyah, Mudaliyar; W. Mudaliyar Muttuvelupillai, R. R B. Kumarakulasinghe, Maniakar; J. N. Sandrasekara, Maniakar; J. Homer Vanniasingham Muttukumarasamy, Mudaliyar, Maniakar; V. M. Muttukumaru, Maniakar; Wm. Mather, T. S. Cooke, V. Chelliah, Maniakar; C. Rasanayaka, Mudaliyar; P C. Nicholas Mudaliyar; A. Charavanamuttu, Secretary and Mr. Retna Mailvakanam, Maniakar.

1. Minutes of the Meeting of 31st March, 1919, were read and confirmed.

2. Read Government letter No. 103/11905 of 23rd April, 1919 re Agri-Horticultural Show. HON. MR. SAPAPATHY moved that a Sub-committee consisting of the Hon. Mr. Sapapathy, Ramalinga Mudaliyar; Sinnaiyah Mudaliyar; Rasanayaka Mudaliyar; Jaffna Maniakar; Mr. Muttuveluppillai and the Government Agent, be formed to draft a scheme. Seconded by SIR A. KANAGASABAI.—Carried; and that a Subscription list be opened. Report to be submitted within a month.

3. Read Colonial Secretary's letter, No. 110/11966 of 30th April, 1919, re loans for construction of agricultural wells.

4. The Government Agent proposed that a Sub-committee consisting of himself, Mr. Mather, Mr. Muttuveluppillai and the Hon. Mr. Sapapathy, be appointed to arrange for import of any surplus paddy from other districts. SIR KANAGASABAI seconded.—Carried.

5. Read Mr. Casippillai's letter about cultivation of Karachchi lands and the desirability of fixing maximum and minimum prices of paddy and rice.

Proposed by SIR A. KANAGASABAI that the Food Controller be requested to consider the desirability of fixing a maximum price for paddy and rice in the Jaffna District. Seconded by SINNAIYAH Mudaliyar and carried.

B. CONSTANTINE,
Govt. Agent, N. P.

THE SCHOOL OF TROPICAL AGRICULTURE.

PERADENIYA.

Prize Day, June 21st, 1919.

The annual prize-giving of the School of Tropical Agriculture took place on Saturday afternoon at Peradeniya. Lieut-Colonel T. Y. Wright, Chairman of the Planters' Association, presided owing to the absence of the Hon. Mr. C. S. Vaughan through indisposition.

Mr. F. A. Stockdale read the following report :—

THE REPORT.

Since the last prize-day of the school, which was held on May 12th, 1917, three courses of instruction have been completed and four others begun. A change in the ordinary curriculum of the school has been made. Students of the English classes now have to undergo training and instruction for two years and the work is more thorough and complete. Classes in the vernaculars are also arranged for, and courses of one year's agricultural training are given to selected village headmen and to teachers in the elementary schools. The English class to whom prizes and certificates are to-day being distributed attended courses of instruction from May, 1917. From 82 applicants 30 were selected. These were chosen from all provinces and from all classes of the agricultural community. There were those who were the sons of landed proprietors and there were those who looked to a thorough training in the sciences underlying agriculture as a qualification for future successful employment. Of this 1917 class 26 completed the full course in March last. Five have been awarded first class certificates, 8 second class, and 13 others satisfied the examiners. During the whole of this course, emphasis has been laid upon practical training and upon plot work, and all students have been given a thorough training in estate accounts and co-operative work. These students should have acquired a general knowledge of the elements of agriculture with special regard to Ceylon conditions; and with practical experience upon estates and in the control of labour should develop into well-trained agriculturists. For this class, 2 gold medals, 5 first prizes and 5 second prizes have been offered for competition through the generosity of leading agriculturists. Government Scholarships have also been given to three of the students of this class to proceed to India for further training before being offered employment in the Agricultural Department of this Colony. These students are being sent to Poona by arrangement with the Bombay Agricultural Department, two for higher training in the sciences of agriculture and one for training in experiment station work.

The 1917 headmen's course in the vernacular consisted of 15. To 13 of this class the school certificate was given and to two others a partial certificate was issued with the recommendation that they should attend the next headmen's course. This class consisted of 12 Sinhalese and 3 Tamils. They were selected for training by the Government Agents and were representatives of nine revenue districts. For competition in this class were awarded three silver and three bronze medals. The course was an elementary one, dealing mainly with those food crops which form the staple industry of the villagers of the Colony. The plot work of these headmen was decidedly good and they showed a keen interest in their work.

The 1918 teachers' course was attended by 14 from six provinces These were selected from vernacular schools by the Director of Education. Nine teachers came from Government schools, three from schools of the Roman Catholic Mission and two from Buddhist schools. The course prescribed was mainly directed towards nature knowledge and the plot work was designed to assist these teachers on their return to schools in school garden work. Throughout the course the teachers applied themselves with remarkable keenness to their work, especially on their plots. All 14 obtained the school certificate. One silver medal, three bronze medals and one book prize were awarded to this class.

The classes at present in attendance at the school consists of the 1918–1920 English class numbering 19, 1919–1921 English class numbering 21, a 1919 teachers' vernacular class numbering 12 from seven provinces, and a 1919 headmen's vernacular class numbering 15, 13 of whom are Sinhalese, and 2 Tamil, from 12 revenue districts.

APPLICATIONS.

The number of applications for admission greatly exceeds the accommodation, equipment and lecturing staff available. The number of applications for admission to the English classes in 1917 numbered 82; in 1918, 50; and in 1919, 43. The applicants are mainly the sons of Ceylonese land-owners, and it is gratifying to report that Government has undertaken to establish a school in the Northern Province in connection with the proposed experiment station, at which special short courses in the vernaculars will be given as well as full courses as designed at the present school at Peradeniya. Applications have also been received from India, Burma, the Federated Malay States, and the Philippines. The number of applications for admission to the vernacular classes has been increasing, and the Director of Education has in conjunction with the Agricultural Department decided to start an elementary training school for monitors and teachers on a site placed at his disposal in Henerat-goda Gardens.

EMPLOYMENT.

While it is emphasized that the course of studies adopted for the English class is designed to afford training for estate work, the increasing needs of the Agricultural Services have resulted in several of passed students of the school being employed under Government. Five students of the school are being sent to India for special training. Reference has already been made to three of them : and of the two others, one is undergoing special training in entomology at the Imperial Research Institute, Pusa, and another is

proceeding to Coimbatore with the sanction of the Government of Madras for special training in paddy breeding and other experiment station work. Three others are being trained as sub-Inspectors for Plant Pests and Diseases and nine have been appointed as Agricultural Instructors under the Agricultural Society. Many passed students are occupying responsible positions on estates, and the Registrar of the School regularly receives good accounts of their work. Others are working their own lands and thereby attempting to profit by the training received at Peradeniya. One passed student has recently been appointed Ratemahatmeya of a large division of Uva upon the death of his father, and others are assisting in many ways towards the improvement of the village agriculture around their homes and towards the establishment of Co-operative Credit Societies. One has been appointed an Udayar in the Mannar District and two others are engaged in responsible work, one in the Dutch East Indies, and one with the Rural Department of the Y.M.C.A. in South India. It is gratifying to know that students of the school are finding employment, but it is hoped to be able to establish in the near future an organisation whereby ready employment of the passed students from the school may be assured. When passed students go to estates, they naturally have everything to learn about estate management and control of labour, but it is hoped that groups of estates will be prepared to join together and offer employment to students at reasonable salaries without demanding the payment of premiums. I look to co-operation from Planters' Associations and the Low-Country Products Association in working out a scheme which will be of benefit not only to the students of the School but also to the Agriculture of the Colony.

STAFF.

There have been no changes in the staff since the last prize-giving. Two lecturers have passed their examinations in Sinhalese and one in Tamil. Importance is attached to a thorough knowledge of the vernaculars by all lecturers. The horticultural work of the school has been carried out or supervised by the Curator of the Botanic Gardens, the estate work by the Acting Manager of the Peradeniya Experiment Station, Co-operation by the Secretary of the Board of Control of Co-operative Credit Societies, and the instruction in estate accountancy has been performed by Mr. D. Clement de Silva, Chief Clerk of New Peradeniya Estate. The examinations of the school have been carried out by the Senior Officers of the Department of Agriculture in collaboration with the school staff and to these officers the thanks of the School are due for their work.

EQUIPMENT.

There are four school hostels, two for the English classes and two for the vernacular. There are three class-rooms mainly of a temporary character. So far it has been impossible to provide suitable laboratory accommodation and demonstrations in practical chemistry are conducted at Trinity College, Kandy, through the courtesy of the Principal. The provision of temporary laboratory accommodation at Peradeniya is now under consideration. There is no doubt that a complete revision of existing arrangements will have to be made. One hundred and fifty eight students (including the 67 now in session) have received training at the school and further provision of accommodation and equipment is necessary.

STUDENTS' RECREATIONS.

Sports consist of cricket, tennis and volley ball at Peradeniya, and football at Kandy. The students, however, get a very considerable amount of exercise in their field work which occupies (with but few exceptions) every morning from 7 to 9-30. The "Peradeniyan," the school magazine, has issued its second and third numbers and has a fourth in course of preparation. The Students' Council has met regularly and dealt with various matters affecting the students' welfare at the school; and the Debating Society has held several meetings.

GENERAL.

The general tone of the school is good and students show satisfactory devotion and keenness in the work. The whole aim of the school is to be thorough. It is thought that students well grounded in the sciences of agriculture are essential to the welfare of the agriculture of the Colony. More and more the world over attention is being given to agriculture, and it is upon a sound training that progress depends. In Ceylon, greater attention must be given to education towards agriculture if the Colony is to fit itself for the march of progress of the next decade. Those that receive a training in agricultural science must have a training that is sound and thorough. Otherwise the foundations of agricultural progress are insecure. It remains, therefore, for agriculturists to support the agricultural school in its efforts. To the speakers of to-day (for their presence and support), and to Mrs. Vaughan for kindly consenting to distribute the awards and to the donors of prizes, I have, on behalf of the school, to convey our thanks. To the visitors I have to accord a hearty welcome, and I hope that they will go away convinced of the good work of the school, and, representatives of agriculture as they are, will assist us in organising other schools of a similar character in other parts of the Colony, and in the establishment of a School of University standing at the Headquarters of the Agricultural Department of the Colony. Agricultural education needs all the support that can be given to it, for agriculture is the keystone of all the economic development and progress of the Colony.

The Chairman then called upon Mrs. Vaughan to give away the prizes and certificates. The following is the list :—

For Agricultural Botany :—1st, the Senanayake prize, presented by Mr. F. R. Senanayake, awarded to J. A. Alles; 2nd, the Pandittasekera prize, presented by Mr. Graham Pandittasekera, G. V. Wickremesekera.

Agricultural Zoology :—1st, the Dias Bandaranaike prize, presented by Sir Solomon Dias Bandaranaike, awarded to J. K. van Buuren; 2nd the De Silva prize, presented by Mr. W. A. de Silva, C. H. Jayasinghe.

For Agricultural Chemistry :—1st, the Fernando prize, presented by the Hon. Dr. H. M. Fernando, awarded to N. Senaratne; 2nd, the Namasivayam prize, presented by Mr. C. Namasivayam, J. K. van Buuren.

Agricultural Economics :—1st, the De Mel prize, presented by Mr. H. L. De Mel, C.B.E., awarded to Q. C. Fernando; 2nd, the Wijeyesekera prize, presented by Messrs. Wijeyesekera & Co., P. de Silva.

CERTIFICATES.

Class 1.—J. A. Alles, Q. C. Fernando, N. Senaratne, J. K. van Buuren, and G. V. Wickremesekera.

Class 2.—V. Aiappen, A. B. Attygalle, *B. G. Buultjens, K. B. V. de Silva, D. P. P. de Silva, P. de Silva, C. H. Jayasinha and J. Don Nicholas.

Pass.—T. B. Beddewela, K. S. de Silva, E. D. F. Jayasuriya, *W. P. Karannagoda, H. A. P. Perera, H. Pussegoda, S. T. Raja, W. H. Rajapakse, G. de Alvis Seneviratne, H. N. Solomons, D. T. J. Weerasuriya and S. C. Fernando.

Partial Certificate.—*R. Ibrahim Jainudeen.

THE CHAIRMAN'S SPEECH.

MR. T. Y. WRIGHT, who was applauded, said :—It is needless to say I feel very much honoured to preside at this prize-giving this afternoon, but at the same time I must express my regret that MR. VAUGHAN, our Government Agent, is not present. Since the last prize-day there seems to have been a change for the better in the school and judging from the number of applications for entrance the school seems to be very popular and becoming more so yearly. What strikes me most in the annual report is the question of employment after your two years' training. I trust that you young fellows, just because you may not be able to get a billet straight away, won't be downhearted and migrate to the towns. Stick to the agricultural pursuits of the land. No doubt there are many attractions for young men in the town, but, I can assure you, you will find that the open air agricultural life in this country is far the best in the end. As Chairman of the Planters' Association, I will do everything I can to help any students of this school to get billets—provided they hold certificates from the authorities saying they are efficient in their work. I cannot help thinking there will be plenty of opportunities for you ; on every rubber, coconut and tea estate continual attention is required to keep in check pests and diseases, and provided you are well up in this, combined with the knowledge and tact of controlling labour, you ought to have no difficulty in getting billets. Quite apart from the question of employment on estates, Government itself will require much larger staffs to keep up with the increasing needs of Agriculture. I can foresee the time when Government, if they are really desirous of making this Colony independent as regards its food supply, will be obliged to give, unreservedly, grants out of the thousands of acres of land which at present are bringing them in nothing and never will bring anything unless cultivated. I will go further and say that Government will be obliged to lend money for the opening of these lands and if these lands are given on the half-share system, one can foresee a reasonable return on the money lent. If this comes to pass, Agricultural Inspectors and other staffs will be required and there will be many opportunities for men like you. As regards the headmen and teachers' classes employment will not be required in quite the same way, but they will, after their training here, be able to pass on their knowledge, not so much as to how food-stuffs ought to be grown, but to pass on the knowledge of getting the very best result from the different products. I do hope that some of you will take up horticulture even if it is only as a hobby. In

*Excluding estate accounts.

certain districts of the Island very fine landscape gardens can be made, but at the present time if one wants a man to lay out a really fine garden he cannot be got. Then there is the question of flowers and orchid growing. I feel sure that many interesting and very valuable hybrids can be raised from imported orchids, but there is no one who goes in for this kind of work in Ceylon. Another thing I am glad to see mentioned in the report is the question of recreation. I feel sure that the men who turn out the best at cricket and football and other games, will, if they give the same energy to their studies here come out top dogs. I congratulate the Director on the interesting report read to-day and I congratulate the recipients on the awards, and hope those who have been unsuccessful will not be down-hearted, and I wish the school and students every prosperity.

DR. FERNANDO'S ADDRESS.

The Hon. Dr. H. M. Fernando, said :—In requesting me to address you this evening on the subject of Agricultural Education, Mr. Srockdale was good enough to state that he believed that the subject was one in which I was interested. I was unable to deny the imputation in that I had the privilege some ten years ago to serve as a member of a Committee on Agricultural Education on the recommendations of which this institution was founded. But the subject is one which I approach with considerable diffidence. It is one of the most debateable topics that has exercised statesmen and administrators, all the world over in recent years. In India during the last two years two conferences of agricultural experts have been held without resulting in any unanimity of resolution. However difficult and debateable the subject may be, I will endeavour to describe some of the objects our Committee had in view when we drafted our report on Agricultural Education in 1908. We recommended the establishment gradually of four schools of agriculture in the Island, starting with one at Peradeniya. The intention was to train young men in the principles and practice of tropical agriculture founded on scientific principles. Such schools were calculated to attract three classes of students. First and foremost, the sons of the landed proprietors and well-to-do agriculturists, who having received such instruction would practise the teaching they had received on their own farms and plantations. Such plantations would thereby become not only more profitable to their owners, but would further serve as demonstration plots worthy of imitation to the neighbours around ; secondly, those young men who intended to devote their careers to practical agriculture as Managers or sub-Managers of estates ; and thirdly, special short courses were to be given for the benefit of elementary school teachers who intended to impart instruction in nature study and in the elements of rural economy in the village schools. By introducing nature study to the elementary village schools we did not intend to set up institutions for vocational training in agriculture. I hope that the public will realize this very important point. Any attempt to teach practical agriculture in village schools as constituted at present will end in failure. The object we had in view was quite another one. We aimed at giving such an education to the village school boy as would fit him to go back to the land if he cared to do so, to enable him to take an intelligent interest in the things around him and in which he would be absorbed during the whole of his working life. The subjects referred to will be taught to him on account of their intrinsic value as a means of education. Their application is left to be

drawn by a process of natural imbibition in the daily life. After what you have heard in the report and from what you know you will readily admit that if he is to advance in his status and get more out of his holding than he obtains at present a very large extent of improvements in his methods is essential. The amount of apathy, indolence and ignorance which the Goiya displays in his work is positively painful to contemplate and is a standing disgrace to the peasantry of this country. Being very conservative in his habits and modes of life very little improvement for him is possible, but such is not the case with the coming generation. If the village schools can get hold of the coming generation and instil into the boys industrious habits, thrift and the necessity of improving the present methods of cultivation, the problem of improving the agricultural practice of the country can be solved. It is the only method available and I hope that through the instrumentality of the schools of agriculture which are included in the programme of the Director the solution will be reached in a short time. We have a very large amount of lee-way to make up in this field of education and I hope that the day will not be far distant when every village school will have its school garden and when every village school boy will be trained in scientific methods of observation, of experiment and accuracy in the recording of their results. These were our aims for the betterment of the Goiya through elementary education, but let all turn now to discuss the role of Agriculture in the plane of secondary schools. Is the curriculum of our secondary schools at present helpful to those interested in agriculture? I am afraid it is not. On the other hand, it may be asserted that our secondary schools need not study the requirements of agriculture. Their purpose is to furnish cadets to the professions of law, medicine, engineering, commerce and the public services, but the peculiarity of our island is such that a large proportion of the members of all these professions, certainly the major part of all those who are successful in them are interested in estates and plantations. These therefore would be better prepared to look after their own interests and be more helpful to the advancement of the country if they had sufficient educational equipment to take an intelligent interest in matters connected with agriculture. How then is this deficiency or defect in our secondary schools to be remedied? A suggestion has been made in certain quarters that some of our secondary schools should add agricultural science to their already over-loaded curriculum of subjects. The Cambridge Syndicate, we are told, recognises agriculture as a branch of science well worthy of study in such schools and we are asked why provision should not be made for its teaching in the Ceylon Schools. Here again my answer is that such an innovation would be a great mistake. Agriculture as a science cannot be taught with any degree of success in a secondary school any more than medicine or surgery can be so taught. Agriculture is not an independent science. It consists of the application of the principles of physics, chemistry, biology and vegetable physiology to the needs of rural economy and the teaching of agriculture without a practical knowledge of the sciences on which it is founded would be worse than useless. Whilst therefore agriculture need not and should not be taught in our secondary schools the teaching of science, which is now compulsory in all our fully organised secondary schools, should be so arranged as to render a bias towards agriculture. But unfortunately for our requirements the present trend of science teaching is entirely

different. In the teaching of science in Ceylon schools the goal aimed at is the English University Scholarship in science and not the necessities of the country. For that scholarship it would seem that the Mathematical sciences are of greater importance than the natural sciences. I have no special antipathy towards mathematics, but I hold strongly to the opinion that if science is to be taught in Ceylon, chemistry, and biology should have the preference over higher mathematics. Certain recommendations have recently been made in the Public Services Commission and elsewhere which I hope will effectively remedy the defect in the curriculum of secondary education I have adverted to. I have now dealt with the subject submitted to me by the Director of Agriculture and with your permission I will make a few remarks on this institution itself. In the first place I have to congratulate the Director heartily for the success he has already achieved with the inadequate equipment and staff that he has had to depend upon. The record which has been read to you clearly indicates how in every particular the work of this institution has yielded the fruits which those who suggested the establishment of a school of agriculture had in view. The nature and the extent of the work done here are exceedingly promising. On the other hand I must confess that I am sadly disappointed at the meagreness of the equipment and the wretchedness of the buildings. In India agricultural colleges and schools have been set up on magnificent lines with lavish expenditure and stately buildings. Why then should it be otherwise here? The subjects of chemistry and botany are taught without any laboratory facilities on the spot. The Government compels every secondary school which teaches science to provide itself with a laboratory. It is then more than an anomaly that the only school of agriculture conducted by the same Government should possess no laboratory facilities. I hope that the Director will get his laboratories built without any further delay and his staff will be increased to the full requirements of the institution. There is one material deficiency in the teaching of agriculture as conducted here, which I cannot overlook. I find that there is no provision to teach dairy work and the management of farm stocks. This is a branch of agriculture of the utmost importance to the development of the Colony and the maintenance of its food supply. The ignorance and helplessness of the managers and supervisors of estates in dealing with cattle disease and in the feeding and rearing of live-stock are appalling, and the only way that improvements of the live-stock of this island can be expected in the future is by providing instruction in farm stock management in the agricultural school and in others of this type which may be established hereafter.

MR. H. L. DE MEL'S SPEECH.

Mr. H. L. DE MEL, C.B.E., the next speaker, said it was his privilege in January, 1916, to be associated with the Director of Education and the Chairman of the Planters' Association to bid god-speed to this School of Tropical Agriculture. They then saw the foundation well and truly laid. Both the Chairman of the P.A. and he as Secretary of the L.C.P.A. then gave the assurance that they would do their best to find employment for the students of the school. And further on behalf of the L.C.P.A. he guaranteed ten billets and to-day there were no fewer that 14 students employed on the estates registered with the L.C.P.A. One reason for his having been asked to speak was to give them his experience of these students who were working

with him and records of whose progress had been sent from time to time to the Registrar. He was glad and pleased very much indeed to testify to their good work. Four of them who joined in 1917 had done excellent work; two more joined in 1918 and two others in 1919. Of these one got an attack of malarial fever and was so scared that he had not seen him since. Of the seven that remained he found them all to be sound, good, reliable boys and certainly two of them were stand-out men. They were good, honest, young fellows with method and discipline about them, and he felt proud to say that they had assisted him materially in increasing the food crops for his labourers. The first impressions of these young men would be of some interest to the students. After they were appointed on temporary probation they were put on to learn estate routine work and the handling of labour. Two months later he got from one of them a very strong sermon on botany telling him all about plant life and various other agricultural proposals. The next month he received an equally interesting treatise on chemistry—all about the nitrification of soils by the application of lime. He returned it telling him that he took it with a pinch of salt. Anyhow these young men were doing good work and although this school was started in strenuous times, they had seen it turn out efficient and reliable men, who were producing food for the benefit of their countrymen. That was an achievement on which they might well congratulate the Director and the Colony on the successful establishment of the school. Speaking of the qualifications of the boys he wished their elementary education was sounder, but with their scanty resources they had done well. As for the future they should have students with a good grounding in English and with an aptitude for honest effort at manual labour. "Take a special interest. I appeal to you, my young friends, in the labour force, that are helping to work on the estates," said MR. DE MEL, "and do something not only to alleviate their position but also elevate and make them happy and contented by attending to their wants. I impress on you that this is a profound duty. It is a great duty for you to produce more and more food, to have in your country livelier and happier souls. If you do that our country ten years hence will smile with prosperity and you will have your reward. You have beautiful environments and the new students will have greater benefits and greater privileges. I hope you will maintain the best traditions of the school and the ideals these beautiful surroundings have breathed within you."

VOTES OF THANKS.

MR. C. DRIEBERG, the Vice-Principal, proposing a vote of thanks to MRS. VAUGHAN said: My duty is a very formal one but the sentiment is none the less genuine. The island is now passing through a strenuous period and ladies with an official connection such as MRS. VAUGHAN, have a very anxious time with their hands full. It is, therefore, all the more necessary to appreciate MRS. VAUGHAN's kindness in coming here this afternoon to distribute the prizes. I trust you will appreciate her kindness at its full value. Therefore I have very great pleasure in proposing a hearty vote of thanks and call upon you to signify your approval in a hearty manner.

The students replied with a cheer and MRS. VAUGHAN expressed her thanks.

MR. STOCKDALE in proposing a vote of thanks to the Chair and to the other speakers said: I have to thank MR. WRIGHT for acting as a stopgap and doing it in an excellent manner. I have also to thank the other speakers for their advice, which I hope the students will take to heart and profit thereby.

THE CHAIRMAN: I can again say it was a very great pleasure to preside at this function. I call upon you students to give three hearty cheers for the Director.

A garden party on the lawn followed.

FRUITS.

GRAPES AT KALPENTYN.

Grapes have been grown in the Jaffna and Kalpentyn districts probably from Dutch times, but the cultivation has gradually dwindled down, and it is doubtful whether there are more than a hundred vines in the former, and a dozen in the latter locality. The original stock has also gradually deteriorated, and within recent years Jaffna grapes have acquired an unenviable reputation as hard sour fruit. In Kalpentyn, however, the grapes are of rather better quality owing no doubt to more careful attention.

The vines are grown on trellises, and undergo pruning twice a year, with the result that they bear two crops per annum. The fruit is borne in May and November, and it is customary to pluck them much too early, in order that they may be carried to distant market-towns, where they are hawked about in open-work baskets or cages.

MR. J. L. L. DE ROZAIRO of Kalpentyn has made a close study of grape-cultivation in all its details ; pruning, manuring, wintering, etc., and has had excellent results.

On the 20th of May last the Secretary of the Agricultural Society inspected Mr. de Rozairo's garden. The main trellis (or pandal) was about 40 ft. × 20 ft., and carried 8 or 10 vines which were yielding a crop calculated at 2000 lb. The bunches were large and full (perhaps too full) and the berries of fair size. It should be possible to get larger berries by judicious thinning.

Another trellis carries a healthy specimen of *Gordo Blanco* (supplied by the Society) which ought to bear next year. MR. DE ROZAIRO expects the main pandal to give him another 2000 lb. of fruits at the end of the year.

The produce he sells on the spot at 40 cts. per lb.

By way of experiment the Secretary brought away a case of fruit, packed in wood dust, to Peradeniya. The fruit travelled well during the week's journey, and went to prove that consignments similarly packed may be relied upon to reach Colombo in good condition. The fruit somewhat lacked in flavour but on the whole, for the local variety, it was as good as could be expected.

With the establishment of better varieties (such as Gordo Blanco, Waltham Cross, etc.) this deficiency should be remedied, and we may before long have a supply equal to the local demand both as regards quantity and quality.

There are one or two points that would-be growers should bear in mind, viz. that grapes will not flourish for any length of time except in localities where the natural conditions (especially the rainfall) are suitable, and

will not yield good crops unless the vines receive the treatment they need. MR. DE ROZAIRO does not adopt methods which he has read about in books but follows the system which his own long experience has taught him. Methods which suit one country need not necessarily suit another: and it is, therefore, much to be desired that MR. DE ROZAIRO's system should be closely studied, if the same success in grape-growing as he has achieved, is to be expected.

New varieties of grapes are being grown at Bandarawella which is another promising locality. The late DR. MUTTUKUMARU was a pioneer in grape cultivation there: and with his death much valuable experience has been lost.

The Society has an order for Australian vines standing over from early last year; but it is hoped that the relaxation of freight regulations will admit of their early despàtch to Ceylon.

C. DRIEBERG.

GRAPE FRUITS.

The grape fruit is a native of the Malayan and Polynesian Islands. It is a variety of pumelo which has arisen naturally and which in recent years has been improved by cultivators and horticulturists. By the majority of botanists the grape fruit is looked upon as the representative of the small types of pumelos, but there are others that maintain that it should be classed as distinct from the pumelo. The pumelo is well-known throughout the East and some varieties are well appreciated. The grape fruit would become popular if good varieties were available. It is very largely cultivated in Jamaica for export to the United States and in Florida there are over 60,000 acres under cultivation with this fruit. Plantations are likewise increasing in California, Cuba and Porto Rico. It is in great demand in America, chiefly because it has been highly recommended for its dietetic and tonic qualities. It is very refreshing and is regarded as a specific for dyspepsia. It is usually eaten at breakfast or lunch,

There are two types of grape fruit. In the one the fruits are pear shaped: in the other they are globular. The latter type is the one more usually preferred. In colour, grape fruit is light-yellow to orange when fully ripe, but under damp tropical conditions the fruit is often still quite green when ripe. For consumption the grape fruit should be cut across through the centre. The papery membranes separating the pulp sacks should then be cut out with a sharp knife and completely removed—the pulp and juice being served with a little sugar in the "skin." The Jamaican and Florida grape fruit are the most esteemed although particular varieties are being developed which are suited to the Californian conditions. In Jamaica the best fruits are produced in the hills from 2,000 to 4,000 feet.—PHILIPPINE FARMER, Vol. V., No. 4.

PESTS AND DISEASES.

RECOMMENDATIONS FOR THE CONTROL OF SHOT-HOLE BORER BEETLE OF TEA.

(*Department of Agriculture, Ceylon: Leaflet No. 13.*)

1. *Plants in the Nurseries.*—The attack in young plants is seldom severe, and if they are not left more than eighteen months in the nurseries and stumped to 6 inches before planting out, the danger of introducing the borer into new isolated clearings is minimized. When stumped, the upper portions of the plants should be burnt without delay.

2. *New Clearings.*—At the time of "centering," coolies should bend down the branches of each bush in the clearing and cut, from the base, all branches which break by reason of the presence of the borer. When bringing the tea into bearing, it is strongly recommended that all slashing methods be avoided, and that the bushes be allowed to run up for an extra period, and be finally pruned down to as low a level as is consistent with estate requirements. The prunings should either be burnt wholesale, or the leaves and small twigs cut off and buried, and the larger wood burnt. If the borer is very prevalent in the tea itself or in the surrounding fields, an application of paint, as described below, should be made to the bushes immediately after the pruning.

3. *Tea in Bearing* : (*a*) *Application of Paint.*—Immediately after pruning apply the following paint :—

Ogden and Tennent's bar soap	...	...	...	10 lb
Rosin (fir)	...	...	...	5 lb.
Crude fish oil	...	...	...	1 gal (=9 lb.)

A detailed description of the method of preparing this paint is as follows :—

The soap is sliced up into a capacious open boiler and heated until it melts, without adding water. When quite melted, the rosin is added and stirred in well. The mixture at once begins to boil, and the temperature must now be kept regular, so that over boiling does not result. When all the water in the soap is boiled off, a dark, amber-coloured liquid results, into which the fish oil is poured. After vigorous stirring for several minutes the resulting hot liquid is baled out into a suitable receptacle and allowed to cool to a solid, which may be cut into bars. For application, 6 lb. of the emulsion is "rubbed up" in 2 gallons warm water, by squeezing with the hand, and the thick white liquid, which must be kept stirred, is then ready to put on the bushes.

Method of Application.—During the various experiments, brushes, cotton waste, gunny, and application by hand were all tried, and the last named was found by far the most economic, and obtained the best results. On poor tea, however, it is advisable to use a small piece of gunny, to prevent

soreness of the hand. Brushes and cotton waste were both very wasteful. The bushes should be completely covered with the liquid, right down to the ground level.

Time of Application.—The chief object of the insecticide is to prevent insects escaping from the bushes between the time of pruning and the output of new shoots, and also to protect the eyes of the branches from attack by borer. The necessity of removing dieback branches after pruning will probably be obviated by the use of the emulsion. The time to apply the mixture, then, is as soon as possible after the pruning of the bushes.

(b) *Diebacks.* — If the above-mentioned paint cannot be applied or procured, all branches which do not put out new shoots after pruning should be cut off and burnt immediately—

At elevations of 100 to 2,000 ft., within 2 months after pruning.

At elevations of 2,000 to 4,000 ft., within 3 months after pruning.

At elevations of 4,000 ft. and above, within 4 months after pruning.

(c) *Tea in Flush.*—Coolies should bend down the branches of each bush and cut off from the base all branches which show the presence of the borer by breaking. At all elevations, when the borer is very prevalent, within nine months after pruning. At high elevations, when the tea is run more than two years between prunings, once within the first twelve months after pruning, and once again between the sixteenth and twenty-fourth month after pruning. On estates where the borer is not severe, once within the first fourteen months after pruning. The branches cut from the bushes should in all cases be burnt without delay.

(d) *Treatment of Prunings.*—The only economic method yet established of dealing with tea prunings is to slash off the leaves and small twigs from the branches after they have been cut from the bushes. The latter are buried in holes or forked into the soil, and the remaining thicker wood is burnt immediately, and the ashes returned to the soil. Leaving the prunings on the ground and burying the prunings both allow adult beetles to escape.

4. *Cultivation.*—Good cultivation is essential to the control of the Shot-hole Borer, and the more insoluble manures, such as cattle bulk, and the various green manure plants, especially the Dadap, are especially recommended.

5. *Green Manure Plants.*—Dadap, Boga medalloa (*Tephrosia*), Crotalaria, and Albizzia are all attacked to a greater or less extent by the insect. It is urged that these plants should be kept under vigorous control on estates, so as to prevent their growing too large, as the more wood they form, the more liable are they to harbour the borer.

6. *Castor Oil Plant.*—No castor trees should be allowed to grow in the vicinity of tea, as this plant harbours the insect to a greater extent than other plants. It has been proposed to use this tree as a trap for the borer, but the fact that the borer will only enter the matured wood of the tree involves a serious risk of more beetles leaving the castor after breeding in it than entering it from the surrounding tea. It would seem that, when the beetle has bred in castor for some time, a distinct "race," but not a distinct "species," of slightly larger size than the insect usually found in tea, is evolved. The same applies to the Dadap. At least one outbreak of this larger race has occurred in tea. The use of castor as a trap cannot be recommended except as an experiment.

Note.—It is pointed out that the application of the paint recommended and the periodic removal of infected branches are by far the most important points in the control of the borer, and it is urged that these methods be tried on estates, so as to establish their efficiency upon an estate scale.

EDWARD R. SPEYER,
Entomologist for Shot-hole Borer Investigations.

THE CORN WORM.

Owing in all likelihood to the very large increase in corn growing pests on corn have very largely increased also. This we expected would happen and so laid in a sheet of instructions for the worst of these—the corn worm. Our Instructors have now been provided with handy dusters after the pattern supplied us by the Entomologist, to show to the people as they go round how simply they can be made and used, and they have also been provided with Paris Green or London Purple, either of which mixed with 50 parts of fine white lime sifted woodashes, or even fine road dust, and dusted over the young corn plants whenever attacks of the corn worm are seen, will be effective. The Government Entomologist hopes to arrange to pay visits in April to the Instructors in the largest corn growing districts in order to help in a systematic campaign against the corn worm. He has also written a good deal on this subject. Notes were published on this Journal in June 1918, page 243 et. al.

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The corn worm is also very destructive in the United States. We take the following from the FLORIDA GROWER entitled "Watch for the Bud-Worm":—

The corn ear-worm, *Heliothis osbleta*, is one of the most destructive insects in the South. It is known by several different names. In the spring and summer it feeds in the buds of corn, attacking the plant when it is about knee-high. Here it is known as the false bud-worm. Later in the season, when the corn is in silk, the moth lays its eggs on the silk and the young worm feeds there for a few days and then enters the ear to feed on the kernels. This generation is called the corn ear-worm.

The next generation commonly attacks cotton, boring into the bolls, and is known as the cotton bollworm. Later generation will attack fall beans, peas, and a variety of crops. The insect is also our most serious enemy of tomatos. It bores into the fruit and is called the tomato fruit-worm.

When feeding as the bud-worm in corn the insect is well concealed, but makes its presence known by the excrement which soils the leaves. If not killed the worm will destroy the productivity of the stalk, although the stalk may live. Late-planted corn suffers more than that planted early because the insects are more numerous. In fact, the ravages of the caterpillars form the chief difficulty in raising late-planted corn.

This pest is easily controlled in corn, where it works as the bud-worm. Dust (the mixture quoted here) down into each hill, preferably in the morning when there is dew on the plants so that the poison will run down into the buds. This dusting can be done quickly by means of a porous muslin bag which can be jarred over the plants.

The next generation feeding inside the ears is much more difficult to control. But the young caterpillars, feeding upon the silk, may be poisoned before they enter the ear. When the silks begin to appear, blow the poison through the corn by means of a dusting machine. Repeat every four to seven days until the silks are well developed. There is nothing to be gained by continuing the dustings after the silks have become dry, as the worms have by that time entered the ear and no eggs will be laid on the dry silks.

On a crop as cheap as field corn usually is, it is doubtful if the dusting of silk would be profitable, but at the present prices for corn it would doubtless pay. On more valuable corn, such as seed corn, it will pay well. The best results will come from dusting the buds especially on late corn. If this is done carefully it will go far toward reducing the numbers of the next generation which enters the ears.

* * * * *

MR. CHADWICK, the Supervisor of Instructors, writes also as follows:—

Corn Planting.—I notice that it is a common practice with corn growers to leave the stalks and leaves after the crop is reaped in the field, when the planting season comes round again corn is planted on the same spot. It is well known that very few fields of corn in Jamaica are free of corn weevils and worms, and the practice of leaving the stalks in the fields furnishes an agreeable home for the weevils and worms to live in and so be ready to attack the following crop.

I notice too, that Smut, which we have always had with us, appears to be on the increase and this may easily be helped by the practice named above.

When corn was cultivated only in small quantities in Jamaica, there was very little danger of pests, either insect or fungus increasing to a dangerous extent, but since corn growers have responded to the efforts of the Jamaica Agricultural Society to increase corn production there is every likelihood of pests increasing as well, and it is a well known fact, that with the cultivation of all plants throughout the world, as the amount of the crop increases so does the liability to be injured or exterminated by pest increase.

If it is intended to crop the same piece of land successively with corn, then the corn trash of all kinds should be carefully removed. What would be better still would be to rotate the crops and follow corn crop with peas, cassava, potatos or some crop not of the same nature; peas for preference.—

JOURNAL OF JAMAICA AGRIC. SOCIETY, Vol. XXIII, No. 3.

THE WHITE-LINED GRAPE VINE SPHINX MOTH.

The principal food-plant of *Hippotion celerio* is the cultivated grape-vine, especially those varieties with tender foliage, though it has been found feeding upon the foliage of *Acacia caffra* and *A. karroo*, these being, undoubtedly, two of its native food-plants. It also attacks tobacco and sweet potato foliage, as well as that of *Ampelopsis veitchi* and *A. quinquefolia.*

The eggs are deposited singly, either on the upper or lower surface of a leaf, never more than 3 being found on a single leaf. The incubation period lasts for from 6 to 9 days, and after a larval period of about 5 weeks pupation takes place just below the surface of the ground. The pupal period varies from 19 days to more than 6 months in the case of the over-wintering generation. The adults of the first generation usually emerge in the spring and there are 4 annual generations.

No parasitic enemies have been reared and the only insect observed to prey on the caterpillars is a large green Mantid, *Sphodromantis gastrica.* Control is best effected by hand-picking or by spraying the vines as soon as injury is noticed with lead arsenate in the form of paste, 3 lb., or powder $1\frac{1}{2}$ lb. to 50 gals. water. When injury to the same vines has occurred in successive years the soil should be cultivated during the winter months to destroy the pupæ.—REVIEW OF APPLIED ENTOMOLOGY, VOL. VII., SEC. A., PART 4.

POULTRY.

ELEMENTARY HINTS ON POULTRY BREEDING.

SELECTION OF BREEDS.

The question of choice of breeds is usually the first which occurs to people wishing to rear fowls. Naturally every one would like to procure breeds of fowls which answer to any exigencies under all conditions, but unfortunately there are no breeds possessing these desirata.

Utility birds cannot possess all the qualities that one would like as many of these qualities necessarily entail corresponding defects. Thus good layers such as the Minorcas and Leghorns have lost the faculty of brooding, while on the other hand the Cochins which are rather poor layers are excellent brooding hens. People should settle their aims before selecting a particular breed and then ascertain whether success is possible with the means at their disposal.

Many breeds such as the Plymouth Rocks, the Orpingtons and the Malays will thrive in a limited space and can be reared in runs, while the Leghorns and Minorcas require a wider range and when kept in small runs are liable to lose their qualities to a certain extent.

As it is impossible to discuss in this Bulletin the qualities and defects of all the breeds existing in this Colony we will simply point out those which have proved to be the best for egg laying and table use.

The best layers in Mauritius are the Leghorns and Minorcas. The former start laying about the beginning of April and stop about November ; the latter start about August and continue until January.

If to the above is conjoined another late laying breed such as the Plymouth Rocks, which lay up to March, one is sure to have eggs throughout the year. Unfortunately in this Colony Leghorns and Minorcas are very delicate and difficult to rear.

It is best for this reason to cross them with the common breed. The crosses are very often just as good layers as the pure bred varieties and besides are much more hardy.

TABLE BREEDS.

In Europe, the Malay breed is not regarded with any great amount of favour, but although there is some foundation for the criticisms which have been levelled against it, the Malay possesses qualities which will never be found so well developed in other breeds. Its hardiness, its weight (which can reach 12 lb. in an adult cock bird), its sturdiness and the considerable development of its pectoral muscles, make the Malay breed most valuable for flesh production. Its crosses with the common hen are hardy and precocious and when 3 to 4 months old are so heavy and well developed

that they surpass all other breeds which are usually barely fit for table purposes at the same age, having more feathers and bones than flesh. Crosses of the Malays with the Orpingtons and Plymouth Rocks are large-sized and of excellent quality, but they are less hardy than the cross obtained with the common hen, and cannot be used for the table at such an early age. They are, however, recommended for the production of capons on account of their fattening propensities.

In addition to the above breeds there are others such as the Plymouth Rocks, the Rhode Islands, the Orpingtons which can be reared with advantage in Mauritius. They possess many good qualities which make them of practical value, but they must be kept pure as it has been proved that their crosses with local breeds are inferior in size, shape, and colour.

The Indian game and Malay breeds as met with in Mauritius do not always produce good market birds. The bird having been reared as a fighter the selection has been made more with a view to improving the moral than the physical character of the breed. Crossing of the Malay breed with the Indian game has resulted in various types. The best are those in which the Indian type predominates.

They should be shortlegged and thick rather than tall and thin, with heavy protruding thighs, a large deep chest and weighing 8 to 10 lb.

SELECTION OF EGGS FOR INCUBATION.

Eggs for incubation should be selected with particular care. As far as possible, eggs from hens between 18 months to 2 years should be preferred and the hen should have all the characteristics of its breed fully developed. Eggs obtained at the beginning of the laying season should be preferred to those laid later.

The eggs should be uniform in shape and size; mis-shaped and thin-shelled eggs should be rejected.

BROODER.

The use of an incubator necessitates the use of a brooder, and besides requires an equipment which is not within everybody's reach.

It does not offer any advantage over hens especially in Mauritius where poultry breeding is not conducted on a large scale. Brooding hens should be provided with a large nest containing thin straw and should not be placed in the run where they are liable to be troubled by other fowls, but in a remote and quiet spot. The nest should be sprinkled at least once a week with insecticide powder in order to keep away Dermanysses.

The number of eggs to be set should be appropriate to the size of the hen. 15 eggs weighing 35 to 45 grams each can be set under an ordinary-sized hen.

If the eggs are big, such as those of the Minorcas which weigh 80 grams at times, not more than a dozen should be placed under a bird.

TESTING OF EGGS.

Seven days after being set, the eggs should be tested, and the infertile ones removed; these can be used in pastry or can be given to chicks. An egg tester can be made with a piece of thick brown or black paper which is

rolled in the shape of a cylinder. When testing the eggs in the day-time one must face the sun ; at night one must face the lamp. The egg is held lengthwise between the thumb and first finger of the left hand, placed at one end of the paper tube and examined by looking through the other end.

If the egg is infertile, it appears uniformly transparent except the central part which is slightly opaque. If fertile one distinguishes an intensely opaque zone rather oblique, in the centre of which is a dark spot, the embryo with numerous blood vessels radiating from it.

PERIOD OF INCUBATION.

The period of incubation varies with the species of birds. It is 21 days for fowls, 24 for guinea fowls, 28 for ducks, 30 for geese, 15 days for pigeons, 24 for pheasants and 30 for turkeys.

HATCHING.

Hatching takes place 24 hours after the eggs have been cracked; chicks should never be removed from their shells by hand ; if they do not come out by themselves it is a sure sign of weakness and they are doomed to death after hatching.

When the chicks have been well dried it is necessary to remove them from their nest and place them in a coop previously disinfected.

They must not be given food for 36 hours after hatching otherwise they get indigestion and diarrhœa. It will be sufficient to place within their reach some pure water, which should be renewed twice a day. It will not be out of place to mention here that it is a wrong belief to think that freedom is indispensable to young birds especially to chicks. In certain cases it has real advantages over the method of keeping the birds in runs; it is none the less one of the principal causes of infection and subsequent loss to poultry rearers.

The most deadly diseases of young birds e.g. syngamosis, coccidiosis, worms, are usually contracted, because the chickens are reared in the open and frequent places which have been infected by adult birds.

To guard against such infections which are fatal to young birds, they should be kept apart in places which can be disinfected; adult birds should not be allowed to come near the young ones.

Birds can be reared in the open only in the country. This method has no doubt certain advantages, the principal being the saving in food consumption. But if account is taken of the losses incident to such methods, the difficulties experienced in distributing food, the caring of sick birds, together with other details more or less important, one is easily convinced that these advantages are not balanced by the losses incurred which can be reduced to next to nothing when the birds are kept in runs.

Moreover this seclusion which is unnecessary after three months, does not influence the growth of the birds, provided they get, whilst in captivity, proper food for their development.

POSITION AND DIMENSIONS OF POULTRY HOUSES AND YARDS.

The runs must be protected against South-East winds and situated on a sloping piece of ground which will ensure the quick drainage of rain water; they must be well exposed to the sun and must contain a few trees and shrubs to offer shelter to the birds on a hot day.

The dimensions of the run vary with the size of the rearing but at any rate need not be more than 40 feet long and 20 feet wide for 100 chickens It is better to construct many runs of the above size, leaving a space between each, than to build one of larger dimensions. A run of the above dimensions should be divided into four equal compartments, in each of them two batches of twelve to fifteen chicks each can be reared until two months old. Birds in the same run should as far as possible be of the same age and colour. If birds of different colour are raised together the chicks must be distributed equally between the mother birds. In this way each bird accepts all chickens of the same run without being able to recognise its own from the others and consequently does not illtreat those really belonging to another breed.

By dividing large runs into smaller ones not only is it possible to group the chickens according to their ages, but also to separate the sick ones from the others, thus preventing diseases from spreading.

Each run should be provided with:—

1. A movable shelter to protect the young chicks during bad weather. A case mounted on legs and covered with tin will answer the purpose very well.

2. An automatic drinking trough sheltered against the sun and rain.

3. Two wooden trays 18 in. × 6 in. to contain minced meat.

4. Two feed troughs for grains and wet mash.

5. Two coops, one side of each to be of fine wire gauze to protect the mother bird and the chicks against mosquitos and other night biting insects.

CHICKEN FEEDING.

Chickens raised in runs should be given a variety of animal food of good quality, containing nitrogenous matter, such as insects, eggs, minced meat and bread soaked in milk, ground maize, boiled rice; these should be given alternately, as chickens soon tire of a uniform diet.

They should not be given any grains, specially uncooked rice, during the first three or four days. A boiled egg morning and evening and two other meals of greens, lettuce and "lastron" finely chopped and mixed with some crumbs of stale bread will suffice for twelve chickens.

On the fifth day they should be given bread soaked in milk at their morning meal, boiled rice in the mid-day meal and ground maize at the evening meal. The morning and mid-day meals may be composed of soft substances but the evening one should be of grains, such as ground maize or wheat previously husked. Animal nitrogenous matter being indispensable it should be given to them at least once daily. It is procurable in the form of insects, such as : white ants, ants' eggs, earth worms, larvæ of flies, short of which, boiled eggs, minced meat or fresh cheese could be given. Larvæ of flies could be obtained without cost, in summer, by means of a series of 7 cases commonly called a verminating cage.

Every day a case is filled with horse or cattle droppings, flies soon deposit their eggs thereon and after seven days it is full of plump larvæ which constitute a choice feed to young birds. As soon as the case is emptied it should be refilled with droppings. Working in this way a valuable feed can be obtained without a break for many months.

When the chickens are about three weeks old, this diet can be increased by adding from time to time some poonac or press-cake, paddy, manioc, or boiled sweet potatos.

If adjoining the run there exist a lawn which is not frequented by adult birds the chickens can be allowed to run on for an hour in the evening. They will there find insects and green stuff and by running after the former they will exercise themselves. The food should never be distributed profusely, only in such quantities as can be eaten by chickens at one time, otherwise it is trampled over, scattered about and dirtied and in case of a mash it gets stale and causes digestive troubles.

The drinking water should be removed every morning; it must be placed in the shade, sheltered against rain, and should contain 5 grams of iron sulphate per litre.

The young birds must not be placed with the adults before they are four months old, and even later if possible as they require more food for their growth than adult birds which are generally fed just enough for their maintenance.

HYGIENE.

Open air, light and exercise are indispensable to young birds, humidity, lack of fresh air and exercise are fatal to them. The feed should be of good quality; chickens must never be given any mildewed grains.

All implements used in a run such as the drinking and feeding troughs, cages, etc., should be swept and washed every morning. All refuse and detritus should be carefully removed. In case of contagious diseases these implements must be disinfected with a solution of Creoline (2 per cent.) of sulphuric acid (1 per cent.) It must be borne in mind that the adult birds are responsible for most of the diseases affecting young chicks. The mother bird is always a possible source of infection. She should be looked after carefully, and separated from the chicks if there is any suspicion of her being a source of infection.

DISINFECTION.

Disinfection is carried on with a view to destroying pathogenic germs. But as these germs are not all of the same nature they cannot all be destroyed by the same disinfectant and the same means.

In connection with domestic birds many kinds of germs have to be considered.

BACTERIA, PROTOZOA, WORMS AND INSECTS.

On account of their microscopic size bacteria and protozoa can be carried through various channels and deposited in almost invisible cracks.

To destroy them, any utensil to be disinfected should be well sprinkled or immersed in some disinfecting agent. The best disinfectants against bacteria and protozoa are the following:—Creoline (2 per cent.), lysol (1 per cent.), Bichloride of Mercury (1/1000), or a solution of sulphuric acid (1 per cent.).

Worms which are swallowed in the form of eggs or larvæ are less resistant than bacteria and do not require such energetic disinfectants.

A 2 per cent. solution of Creoline will destroy them in the majority of cases.

As humidity is one of the most favourable conditions for the development of these parasites, good drainage and plenty of sun are absolutely necessary.

Insects and earth worms being still less resistant than worm parasites are easily destroyed by fatty matters such as Kerosene emulsion, sulphur, naphthalene or Pyrethrum powder.

Whatever may be the disinfectant or insecticide used, it should always be borne in mind that it can only prove effective when used methodically and at the right time.

DIET.

The diet varies with the age of the bird, its breed, the conditions under which it is kept and the purpose for which it is reared.

Birds raised in the open, and running about where they like, find a considerable part of their food in the form of worms, insects, molluscs and seeds.

In these circumstances their upkeep is not expensive, and it undoubtedly pays to rear them. When, however, birds are kept in runs, or poultry yards in a limited space, they have to rely entirely upon the food given to them and, as we shall see later, the raising of common breeds cannot and never will be profitable under such circumstances.

The quantity of food to be given depends entirely on the circumstances under which the birds are reared and on their age; we have therefore to consider three different diets: early-age ration, maintenance ration, and ration of production.

EARLY AGE RATION.

It has been ascertained that the daily increase in weight, up to three months, is 20 grams for 80 grams of food absorbed. The table given below according to Voitelier, shows the increase in live weight of young birds and the approximate weight of food needful for their nutrition.

Age of bird.	Daily gain of weight grams.	Daily food requirement, in terms of grain grams.
Up to 1 month ...	4	10
1st to 2nd month ...	10	30
2nd to 3rd month ...	15	55
3rd to 4th month ...	20	80

From the 4th month, the increase in weight, for the same quantity of grains, decreases and is only 15 grams daily, between the 4th and 5th months.

During the growth of young birds, animal and nitrogenous matters are essential for the formation of the muscles and frame, and only food rich in these should be employed. Foods containing a high percentage of fats and oil should be avoided as they will fatten the birds, and thus will retard their development.

Whatever may be the brood reared, one should endeavour to produce high class birds only ; this can be secured by giving substantial food to the young ones. Their ration will depend on their appetite which must be stimulated by every means. A varied diet will generally bring about the desired result. Feeds must be diversified otherwise the birds will soon be satiated and disgusted. The use of watery substances such as manioc, sweet potatos and other roots, should be avoided as these, compared with an equal quantity of grains, contain much less nutritive elements.

Chicken rations should be distributed three or four times daily, and should be composed ot insects or meat, maize or poonac, bread soaked in milk : dhall and crushed gram should constitute a fifth part of the ration.

It is better to distribute these feeds separately and alternately than to mix them together. Coral sand, charcoal dust, and green herbs must always be kept in the run. Vegetable refuse or manure should be kept in a small pit, in order to attract insects ; the small birds will eagerly run after them, thus obtaining good exercise.

MAINTENANCE RATION.

Maintenance ration is the quantity of food necessary to a healthy adult bird, for the maintenance of its weight, and the proper functioning of its organs. It may be taken that 100 grams of wheat are strictly sufficient for the upkeep of a fowl weighing $1\frac{1}{2}$ to 2 kilos, i.e. the weight of a common Leghorn or other small breed.

Large sized birds, such as the Plymouth Rocks, Orpingtons and Malays, of which the hens weigh between 5 and 6 pounds, and the cocks between 8 and 10 lb., should get a maintenance ration in proportion to their size, i.e., increased by 25 to 50 grams daily over that given above. Wheat is usually taken as the unit of feeding, but is not easily procurable on our markets, while the price is rather high.

In consequence, the accompanying table has been prepared, it shows the composition of a number of feeding stuffs in comparison with wheat which is accepted as the standard.

In the last column is given the food value of each of these materials in units, based on the assumption that fats and albuminoids are about equally valuable from a nutritive point of view, and are each $2\frac{1}{2}$ times as valuable as carbohydrates. This valuation, while only an approximation to scientific accuracy, will be found useful in computing rations for poultry, and in calculating the relative value and cost of different articles of diet.

It is to be remarked that the diet may have to be modified to suit different purposes. Thus in fattening birds for market, increased amounts of carbohydrates should be given ; for egg production, the amount of albuminoids requires to be augmented.

In this connection, the last column but one of the table is of interest, as it gives the albuminoid ratio for each of these foods. This figure is the ratio borne by the albuminoid matters to the sum of the carbohydrates plus the fats.

$$\text{i.e. Albuminoid ratio} = \frac{\text{Carbohydrates \%} + \text{fats \%} \times 2{\cdot}5}{\text{Albuminoids \%}}$$

To reduce the contents of fats to the same value as carbohydrates their value is multiplied by 2·5. It follows, therefore, that for fattening, foods with a high albuminoid ratio are to be preferred, while those with a low albuminoid ratio are indicated for egg production. At the present time, imported grains are so expensive that their use is practically prohibited. In this connection, interest centres in local foods of which maize is specially important. Manioc and sweet potatos are also valuable and are relatively rich in carbohydrates: if arrangements can be made for drying these and feeding them in the form of chips, they constitute an excellent starchy food. Deficiencies in protein can be made up by means of maize, coconut press cake, or dry blood.

MEAN PERCENTAGE COMPOSITION OF FOOD-STUFFS.

Food-stuffs	Carbohydrates.	Proteids.	Fats.	Fibre.	Ash.	Albuminoid Ratio.	Food Unit.
Wheat	11	10	1·6	2·0	2·0	8·2	100
Oats	60	8	5·5	12·0	4·0	9·2	94
Paddy	65	6	2·0	8·0	6·0	11·3	85
Dhall	60	18	1·5	6·0	4·0	3·5	109
Gram	60	18	4·0	6·0	3·0	3·9	115
Poonac	44	15	16·0	12·0	5·0	5·6	117
Maize	70	10	4·5	1·5	2·0	8·1	104
Manioc	32	1	—	2·0	1·0	32·0	35
Sweet-potatos	24	1	0·5	1·0	1·0	24·0	28

RATION OF PRODUCTION.

The aim of a ration of production, in the case of domestic birds, is to obtain the greatest number of eggs possible.

Certain breeds only can be used for this purpose, notably, Leghorns and Minorcas, which may lay as many as 220 eggs a year. These results can however be obtained only by giving the birds a special diet, based on the composition of the egg. Egg production is, in fact, only the sum of the supplementary food absorbed by the hen and transformed by it to another form.

It is interesting to know the composition of an egg which according to VOITELIER is as follows:—

Shell	11 to 13	per cent.
White	59 to 60	,,
Yolk	27·5 to 29·5	,,

According to WICKE the shell is composed of:—

	Hen.	Goose.	Duck.
Calcium carbonate	92·70	95·26	94·43
Magnesium	1·30	·72	·50
Phosphates	·75	·47	·84
Organic matter	4·25	3·55	4·23

The composition of the egg without its shell is as follows :—

	Water.	Nit. Matter.	Fats.	Ash.	Non-Nit. Matter.
White ...	50·56	9·49	·17	·35	·41
Yolk ...	14·73	4·69	9·90	·31	·03
	65·29	14·18	10·07	·66	·44

It is seen, from the above, that a supplementary ration of grains and mineral matter should be given daily, conveying the following amounts of different compounds :—

Nit. Matter.	Fats.	Ash.	Non-Nit. Matter.
4·14	3·18	·22	·15

for 15 eggs laid during a period of 25 days and representing a total weight of 900 grams.

These amounts should be given, as far as possible, in the form of animal food, for, it has been clearly demonstrated that, without the addition of insects, minced meat or blood to the diet, intense laying cannot be maintained. In practice, the ration may conveniently contain at least $\frac{1}{5}$ of the total in the form of dry blood or meat.

The amount of material needed for the formation of an egg and the value of the substances contained therein being known, it is easy to calculate the cost of an egg from the following formula.

MAINTENANCE RATION + SUPPLEMENTARY RATION NUMBER OF EGGS.

If, for example, we use poonac and maize as maintenance ration and the same, with the addition of dry blood and meat, as supplementary ration for an average of 150 eggs, for 8 months, we find :—

Maintenance ration for one year at present price :—

Poonac	Rs. 2·19	
Dry blood or meat	,, 4·19	
		Rs. 6·38
Supplementary ration for 250 days :—		
Poonac and maize	Rs. ·78	
Dry blood and meat	,, ·51	
		Rs. 1·29
	Total ...	Rs. 7·67

If we assume the sale value of eggs at 8 cents each, we get :—

150 eggs at ·08 cts.	Rs. 12·00
Cost of production	,, 7·67
	Rs. 4·33

this shows a balance of Rs. 4·33 which can be considered as nett profit, on 150 eggs, neglecting the cost of the hen.

If instead of rearing good laying hens, such as the Minorcas and Leghorns, other breeds, which are not as good layers, are raised under the same

conditions, the expenses incurred will be the same but the number of eggs obtained may fall below 100 ; in such a case, instead of a substantial profit, a loss may be encountered ; for example :—

100 eggs at 8 cts.	... ...	Rs. 8·00
Total cost of ration and production	...	,, 7·67
		0·33

This shows a doubtful profit of 33 cents, and takes no account of the value of the hen. The profit will be much higher if pure breeds are raised, as there is a great demand for eggs, for sitting, and these fetch much higher prices than those for ordinary consumption.

The rearing of fowls in runs, in order to be remunerative, is largely a question of breed. Ordinary layers and common fowls can only be reared profitably when raised under country conditions, where the fowls have a free range to pick up their food. In such cases, the birds find nitrogenous animal matter in abundance and it follows that the supplementary ration can be done away with, while even the maintenance ration can be reduced to a great extent, so as to cost only Rs. 3 to Rs. 4 yearly instead of a much larger sum. Even at this figure, on an average of 75 eggs per annum, the profit will be only Rs. 2 to Rs. 3 per head.

The above remarks in relation to egg production are equally true for the production of fowls for the market.

It can be calculated, from the figure given, that the amount of grains eaten by chicks, up to the age of 4 months, is equal to approximately 5,250 grams for breeds which develop quickly and, at this age, their weight may attain 1,500 grams under European conditions. In Mauritius, however, this weight is never reached at that age.

The table given below shows the average weight of birds of various breeds, at different ages, under colonial conditions :—

Cross of local breed and Indian or Malay game	3	months,	600 grams
Cross of local breed and Indian or Malay game	2½	,,	375 ,,
Cross of local breed and Indian game ...	1	,,	200 ,,
Minorcas	2½	,,	350 ,,
Plymouth	2½	,,	340 ,,
White Leghorn	2½	,,	300 ,,
Leghorn	1	,,	175 ,,

Taking for granted that a young bird weighs 800 grams at the age of 4 months, and that its market value is Re. 1, we see that it does not pay to rear birds in runs or in small yards, as 5,250 grams of poonac and maize, mixed in equal proportion, cost 90 cents at present prices, to which must be added the cost of the egg, the upkeep of the mother bird during three months at least, and the losses incurred by accident or sickness.

On the other hand, if pure breeds are raised, under the same conditions, their selling value being five to six times higher, it stands to reason that they will leave a fair profit. In fact, it can be stated that in view of the present cost of food, only pure breeds can be raised in yards with profit. The common breeds must be reared in the open, in order to be profitable.—BUL. No. 12 OF THE DEPT. OF AGRIC., Mauritius.

FIBRES.

THE FLAX INDUSTRY.

J. ROBILLIARD,

(*Senior Inspector, Farm Products*).

Flax has been grown to a limited extent in this State, chiefly in Gippsland, for many years past, and though encouragement in the form of a bonus was given to growers by the State Government some years ago, and recently by the Commonwealth Government, the industry has not made the progress it merited, or that was anticipated.

The experience gained, however, has clearly proved that, given proper conditions, flax will grow well in many parts of the State, and in normal seasons give satisfactory yields of both seed and fibre.

There is a local demand, which may be greatly increased, for a considerable quantity of both products, which, up to the present, has been only partially supplied. Should the area under flax be so increased as to produce more fibre than is required for home consumption, there exists a practically unlimited market in the United Kingdom at prices which at present rates should prove remunerative.

Prior to the war Russia produced about 80 per cent. of the world's requirements of flax fibre, the export of which was, of course, stopped at the outbreak of war; and with that portion of the Russian country where the crop was largely grown falling into enemy hands, the industry, if not temporarily stopped, must have received a very severe check, and owing to present conditions it is unlikely that Russia will for quite a long time be in a position to produce quantities equal to her former output, Belgium and the North of France also exported a fairly large proportion, but they, too, will probably not be in a position to produce normal quantities for a considerable period. The very great shortage has naturally caused a rapid increase in flax values, recently reaching high figures; present prices may not be maintained, but, taking all things into consideration, it is only reasonable to suppose that flax will for several years hence command fairly high prices. Then should not Victorian farmers in suitable localities give flax cultivation their serious consideration?

Not being able to obtain their supply of flax from the customary sources, the British Government were forced to look for it elsewhere, and about 12 months ago arranged to purchase, at a satisfactory figure, the fibre produced from all flax grown in Australia during the last year. This enabled the Commonwealth Government to guarantee growers £5 per ton for unthreshed flax of a given standard. A committee was appointed to encourage its cultivation, and their efforts resulted in about 1,500 acres being sown, the product of which is now being treated.

The Commonwealth Government is now guaranteeing the growers £6 per ton for all fibre flax of standard quality grown this year. The standard quality means well-grown unthreshed flax, appraised by the Committee as of average quality, of average length in sheaf of 30 inches, well seeded, free from disease, weeds, and foreign matter, properly harvested, properly tied, and delivered in good order and condition to the nearest scutch mill.

CULTIVATION.

It is commonly stated that it is impossible to produce a good grade of flax (*Linum Usitatissimum*) fibre without sacrificing the seed. This, however

is a misconception, and European authorities are now advocating the production of both from the same crop. This practice has been followed in Victoria, and where the climatic conditions are suitable the resulting fibre is found to be of satisfactory quality, and compares very favourably with that grown in other countries.

CLIMATIC CONDITIONS.

The successful growing of a crop from which both fibre and seed may be profitably obtained requires an annual rainfall of from 26 inches upwards, with a reasonable proportion distributed throughout the growing period and preferably with frequent showers in Spring; though if seed only be the object, it may be successfully grown in districts having a somewhat lesser rainfall.

SOIL.

Flax will grow on a wide range of soils, but a warm, reasonably free soil is required, in a good state of fertility, well drained and free from weeds. It is, therefore, rather difficult to name any particular class of land as really the best. A very good soil, however, is a chocolate or rich and fairly deeply loam overlying a well drained clay subsoil, while extremes of clay, light sand, wet, or poor land of any description should be avoided.

As a further guide to suitable soil, situation, and climatic conditions, it may be stated that, generally speaking, flax will probably give satisfactory returns on land that is capable of producing a heavy crop of oaten hay.

PREPARATION OF SEED BED.

The land should be clean, or as nearly as possible, free from all kinds of weeds, but more specially strong or tall-growing ones, such as wild turnip, dock thistle, etc. If they appear after growth has commenced they must be cut out at the most suitable period, for weeds not only occupy space that should be growing flax, but cause considerable trouble and loss in the treatment of the fibre.

It is very necessary that the soil should be well worked, thoroughly pulverized to a fine tilth, and made as level as practicable, thus ensuring an even depth when sowing, a more uniform growth of plants, greater ease in harvesting, and permitting the crop to be cut lower than would otherwise be the case, resulting in a heavier yield and longer fibre.

VARIETIES.

Several varieties are cultivated commercially, some of which are grown for seed purposes only and considered unsuitable for fibre, while others are grown for fibre, or, for the dual purpose of both fibre and seed.

Some years ago about half-a-dozen varieties, including both blue and white flowering sorts, were introduced and tested, but it is stated that neither proved as suitable for the production of fibre and seed as that introduced many years ago, and from which satisfactory yields have been obtained; consequently the former varieties have been discarded, and the latter retained, and is the only one at present grown in the State for commercial purposes and recommended for cultivation.

It is interesting to note, however, that during the past year experiments in the matter of seed selection have been made at the Werribee Research Farm, a short account of which, with illustrations, appeared in last month's journal. The experiments at Werribee will, no doubt, be carried out on a larger scale during the coming season, and it is hoped that more suitable or better yielding kinds may be obtained.

SEEDING.

Victorian experience covering a number of years has shown that, under normal conditions, the best time for sowing is during the latter part of April or the first week in May: but in very late districts or moist situations the

time may be varied somewhat to suit local conditions. Nevertheless, early sowing is strongly recommended, the object being to have strong, well-rooted, and firmly-established plants before depth of winter, which would be ready to make rapid growth with the approach of warmer weather. Early sowing is likely to produce a tall crop and consequently long fibre, and in the event of caterpillars being plentiful, the bolls or seed, of which they are very fond, should be so far matured that the pest will leave it for more succulent food. A fibre crop requires to be sown thickly, so as to insure tall stalks with few branches, and for this purpose from 56 to 60 lb. of seed per acre is recommended, though some growers sow up to 65 lb. The seed should preferably be sown broadcast, and this can be done with an ordinary drill, by lifting the tubes and allowing the seed to fall on a board and scatter. The quantity of seed mentioned can be readily sown by itself, and therefore, should not be first mixed with manure, as if left for a time before sowing, the seed is liable to injury. If a crop of seed only (not fibre) is aimed at, a sowing of from 20 to 30 lb. per acre, according to local conditions, should be sufficient, as this would allow the plants plenty of room for growth and branching.

MANURES.

On this subject, also, there is much room for experimental work, which in all probability will be carried out, as far as possible, this season in several centres, and it is hoped that useful data will be secured for next year's operations. For the present, however, it may be stated that bone or bone and superphosphate, in equal proportions give good results, and is usually applied rather more freely than for a cereal crop, for, as previously stated, it is desirable that the young plants should in every way be helped to make good growth before winter.

HARVESTING.

The best time for harvesting is when most of the bolls have turned brown, though some of the lower ones may yet be more or less green. A further guide is that the stems at this stage usually, but not necessarily, begin to turn yellow, and the lower leaves to drop off, though, if in a moist situation, the plants may not lose their foliage so early. Flax can readily be cut with a reaper and binder, but the machine must be in good working order; plain knives are best, and require to be well sharpened; an old, well-worn machine with blunt blades would probably give a lot of trouble. Sheaves should be small, well butted and tied rather nearer the head than otherwise, the bands having a tendency to slip down. Long narrow stooks are best, and should be stacked as soon as ready, as standing in the paddock longer than necessary causes loss.

In the Drouin and Warragal districts a yield of from 2 to 2½ tons per acre is considered good though 2½ tons is not uncommon, while anything above that is exceptional.

FLAX MILLS.

Two flax scutching mills (those of MESSRS. WOLFF BROS., of Drouin, and F. C. JENCKE, of Longwarry South) have been working for many years past, treating the material grown in these districts. During the past season MESSRS. WOLFF BROS. have found it necessary to increase the capacity of their plant considerably, and two co-operative mills have been started—one at Buln Buln and the other at Dalmore, each to treat the flax grown in their vicinity.

PROCESSING FLAX.

The first process to which flax is submitted is that of "threshing" or "boll crushing;" this is accomplished by the aid of a flax thresher. The operator standing opposite the end of the shafting and holding the sheaf by the butt, with the head spread out fan-like, allows it to pass between the revolting rollers, thus crushing the bolls and liberating the seed, which is then conveyed by an endless belt in a chute to the winnower and cleaned.

RETTING.

Retting is done in one or two ways, known respectively as water retting and dew-retting. In Belgium, where the highest grade of fibre is produced, the flax is retted by placing it in crates and steeping for a given period in the river Lys, a slow-flowing stream, whose waters are peculiarly suitable for the purpose. In Ireland and other places the flax is placed on end in pits of 4 or 5 feet in depth, and varying in length and width to suit requirements, then weighed down to prevent floating, and covered with water until sufficiently retted. The method practised in this State is "dew retting;" this is accomplished by spreading the threshed straw in a thin layer in long rows a few inches apart on a grass paddock, the heads of all straw lying in the same direction. Though termed "dew retting" the dew, rain, and sunshine all play a part in the process. The length of time the straw is left out varies considerably, but is usually five or six weeks, according to weather conditions. To insure even retting the flax has to be turned once or twice during that time. This is readily done by commencing with the outside row, and pushing the end of a long slender rod under the straw just below the heads to a distance of 3 or 4 feet, then lifting the straw and turning it right over with the heads pointing the opposite direction, the second row being turned so as to lay on the ground from which the first has been removed.

FLAX BREAKING.

The success or otherwise of a scutch mill depends largely on the straw being correctly retted, for both under or over-retting mean much loss of time and material. Retting is a process of decomposition, which must proceed far enough to destroy the gummy matter holding the fibre to the woody portion so as to allow the latter to be fairly readily, but not too easily, beaten from the former. If allowed to go beyond this stage, the woody material could be more easily brushed off, but the fibre would lose strength, and, if left long enough, become valueless.

When sufficiently retted the straw is picked up, tied in bundles and, if not quite dry enough, stood in stooks and then stacked until ready for the breaker.

As much of the retting as possible must be done in autumn and the balance in spring, the months of June and July being avoided. Spreading should be commenced as soon as practicable after threshing; but, as it is necessary to have fine weather to dry the straw when "picking up," it should be continued after, say, the end of March, so that it may be gathered in by the middle of May; even earlier would be better, for after that the weather is usually very broken, and drying the straw would be rendered exceedingly difficult, and if not dried and stacked when ready much loss may result.

BREAKING.

The breaker consists of several pairs of fluted rollers, the upper ones being pressed against the lower ones with springs. The flax is separated into small bundles of about as much as can be grasped in one hand, then spread in a thin layer the full width of the rollers and allowed to pass between them to the opposite end; the woody portion is thus broken into short lengths known as "shoves."

SCUTCHING.

From the breaker the flax is passed to the first scutcher, where it is roughly dressed. The operator holds a handful by one end in his left hand, and with his right spreads and guides it to the beaters, running at about 300 revolutions per minute, and when roughly cleaned passes it to the second scutcher, which, in a similar manner, finishes the cleaning process. The only remaining operation is bundling and baling, and when these are completed, the flax will be ready for marketing.—Journal of Department of Agriculture, Victoria, April, 1919.

CO-OPERATION.

CO-OPERATIVE CREDIT SOCIETIES IN RAYIGAM KORALE.

Rayigam Korale is one of the four Chief Headmen's divisions in the District of Kalutara in the Western Province, and is purely an agricultural Korale. The chief crops grown by the village population are the paddy and vegetables, Dry grains, yams, manioc and sweet potatos are also grown to some extent. The wealthier classes have rubber and coconuts as their chief crops.

There are over 13,000 acres under paddy and several hundreds of acres are annually cultivated with vegetables. In these cultivations the average village cultivator whose means and resources were not very encouraging has no satisfactory medium by which his requirements are met. He has often to seek the help of the wealthier classes or the money lender. This system did not answer his purpose, and he was by no means able to become a contented cultivator. In the year 1913 the Mudaliyar of the Korale with the advice of the then Assistant Government Agent started a Co-operative Credit Society in a village centre. The villagers appreciated the work of the Society and the Mudaliyar encouraged by the good results of this Society started four other Societies within a few years. These Societies help the cultivator financially to carry out improvement in his cultivation. The five Societies are situated in convenient centres, viz. :—Wewita, Horana, Handapangoda, Galpatha and Haltota. The radius of operation of a Society does not extend beyond 4 or 5 miles and the villager can easily attend meetings of Societies at which business is transacted. Meetings are held regularly and are presided over by the Mudaliyar who has the co-operation of his minor headmen and others who have volunteered to work for the cause. The services of five teachers of the village vernacular schools have been engaged as honorary secretaries and the Mudaliyar has similarly retained the services of men of status as Treasurers. The Committees of these Societies are made up of intelligent headmen and prominent men in the villages. These Societies lend money to members at a low rate of interest for cultivation and other useful purposes. The rate does not exceed 10 per cent. per annum which is considered a fair rate. The Societies also supply manure for paddy and vegetables on easy terms. A Colombo firm supplies the Society, and the Society in turn supplies to members. In this way a large quantity of manure is being supplied to members. These Societies last year dealt with over 45 tons of bone manures for paddy. Hitherto the villagers purchased their manure for paddy from village boutique-keepers at high rates, and now they have the advantage of receiving manure at almost cost price and of paying for manure after their harvest. In this way these Societies have gone a great way to release the villagers from the thraldom of the money-lender and to inculcate the principle of thrift and self-help.

These Societies have also put a stop to reckless borrowing which has been the ruin of the villager. Apart from material benefit there are also moral and social advantages enjoyed by the people.

The following particulars regarding the working of these Societies will be found useful. On 31st March, 1919, which is the end of the financial year of these Societies, the 5 Societies had 793 members and a paid-up capital of Rs. 7,648 as detailed below :—

Name of Society.	Members.	Paid up Capital.	Reserve Fund.
Adikaripattu Society ...	209	Rs. 1,480·00	Rs. 558·68
Kumbukkepattu Society ...	171	,, 1,852·00	,, 382·81
Haltota	114	,, 2,088·00	,, 507·24
Handapangoda ...	152	,, 1,209·00	,, 520·12
Galpatha	147	,, 1,019·00	,, 251·76
	793	7,648·00	2,220·61

Of the five Societies the Adikaripattu, Kumbukkepattu and Handapangoda have paid bonuses to members.

The first four Societies have received Government loans. The Adikaripattu, Haltota and Kumbukke pattu received each Rs. 1,000 and the Handapangoda Rs. 500. The Kumbukke Pattu Society has paid back two instalments of Rs. 100 each to Government.

The Handapangoda Society obtained the lease of some 7 acres of Crown land last year which the Society asweddumised and obtained a crop of some 196 bushels of paddy—a fourth of which was the Society's share.

The Kumbukke Pattu Society and the Handapangoda Society took part in the garden competition and four of the members of these Societies—two of each Society—obtained money prizes offered by the Ceylon Agricultural Society through the Registrar of Co-operative Credit Societies.

The Adikaripattu Society held a small village Show last year and the Kumbukkepattu propose to hold one this year.

The Societies are making progress and there are signs of possible extension of operations of these Societies to every village. These are pioneer Societies in the Kalutara district and it is gratifying to state that in the other 3 Chief Headmen's divisions Co-operative Societies have been started and at the present time there are 11 Societies between them, making 16 in all for the District.

This short account of these Societies will not be complete without adding a word of praise to GATE MUDALIYAR J. A. WIRASINHA who took the initiative to establish and foster these Societies in his Korale. He took a personal interest in them and made the Societies what they are now. It is a matter for satisfaction that the great work started by the Mudaliyar has borne good fruit. The villager has been benefited by them and he has begun to place in them his confidence.

GATE MUDALIYAR WIRASINHA had to leave the district on retirement from Government service and his departure is keenly felt by the Societies. But the villager will be ever grateful for the good he has done in the establishment of these Societies.

N. W.

GENERAL.

CEYLON BEE-KEEPERS' ASSOCIATION.

Minutes of a meeting of the special Sub-Committee appointed of the C.B.K.A. to go into the question of a standard hive for the Ceylon bee, held at the Government Stock Garden, Peradeniya, on Saturday, the 17th May, at 9 a. m.

The following were present: Messrs. H. S. Stevens, R. Smerdon, C. Drieberg and A. P. Goonatilleke.

Mr. Claude Crozier was prevented from attending by ill-health, and Mr. Chas. Andree sent a letter of excuse.

The question of the requirements of the Eastern (*Apis Indica*) bee as compared with those of the Western (*Apis Mellifica*) bee were fully discussed, and the experience of those present brought to bear on the question of the most suitable size of frame. The different types of hives on the premises were also critically examined.

After nearly two hours' deliberation the Sub-Committee passed the following resolution :—

That this Sub-Committee recommends the Ceylon Bee-keepers' Association to adopt provisionally frames 5 inches deep, and 11 inches long for the *Apis Indica* bee, and that at the end of two years the experience of those who have used the hive be carefully invited and the question of making the provisional absolute, or of altering the size of frame, be considered.

In the meantime it is suggested that beginners in apiculture (school teachers and others) be advised to use the same size of hive.

MR. SMERDON undertook to construct a sample hive for frames of the approved size, which he will submit for the approval of the Committee at a meeting to be held in June.

C. DRIEBERG,
Secretary, Ceylon Bee-Keepers' Association.

THE USE OF PRICKLY PEAR AS FODDER.

The use of prickly pear as fodder in the Bombay Presidency began in 1907 when REV. A. NORTON of Dhond during a fodder famine adopted a method of burning the thorns off the cactus and feeding to starving cattle. This method was repeated in every year of scarcity particularly in 1911 when there was a really bad fodder famine in the Nagar District. It was felt that the method needed careful study and experiment before it can be advocated on an extensive scale, and in 1913 there was a thorough and prolonged test made at the Agricultural College Dairy Farm at Kirkee. The following year the method was demonstrated with some success in the Ahmednagar and Poona Districts and it is stated that now over 15,000 cattle in the Nagar District and about 2,000 in the Poona District are being fed partly or wholly on cactus.

The Revenue Department (Famine) of Bombay have printed for the use of District Officers a document entitled "Notes on the Use of Prickly Pear as Fodder." The equipment and implements required are drawn and described in detail and it is there recommended that in a district where no work has so far been done it is best that a complete equipment be obtained from "The Prickly Pear Department, Agricultural College, Poona." The equipment tried, tested, and approved can be supplied for one of two methods, i.e., that of burning the thorns off by hand blow lamps or by burning over a fire of dry wood with an airblast supplied by an ordinary blacksmith's double bellows or a rotary blower. Mr. Beys developed this second method.

VARIOUS METHODS OF PREPARING CACTUS.

There are various methods that may be adopted for preparing cactus for use as fodder. In all the methods the aim should be to remove or render harmless the thorns. These are of two types—1st, the large thorns and; 2nd, the small tufts of fine hair-like thorns found at the base.

These can be (1) cut out or (2) burnt off or the cactus may be (3) ensiled or (4) steamed or cooked so as to soften the thorns.

The first method has been used widely in Madras and the Southern Mahratta Country in previous famines. This method at best is slow and laborious. One person can prepare enough prickly pear for two cattle in one day. The method adopted is to first cut round the edge of each "leaf" with a knife, gouge, or specially shaped pincers. This removes the majority of the thorns. Then the rest of the thorns about a dozen on each side of the "leaf" are removed one by one.

These thorns are very shallowly situated and can be completely removed by cutting less than ½ in. below the surface.

The trouble about this method is that it is not done carefully, large quantities of the fine thorns are left sticking to the leaves and to the operator's hands.

The third method is said to be done extensively in South Africa but has never been tried out in India. The cactus is packed in silo without any preparation and left for a very long period. The mass is then cut up and fed to cattle.

The fourth method is said to be used in Australia but has not been tried with any success in India. The cactus is steamed in a specially prepared boiler.

The 2nd method of burning the thorns off can be tried in several ways e.g. the standing pear can be burnt by heaping rubbish round it and setting fire to the whole thing or as is done in Texas by the use of petrol or kerosene torches. These methods cannot be recommended because they have yet to be thoroughly tested The methods which have been thoroughly tried and found to be safe, effective and economical are (1) cutting down and hanging up and burning branches with hand blow lamps or (2) over a blown fire of coke, charcoal or light dry wood.

THE TECHNIQUE OF BURNING THORNS OFF.

The requirements of an effective system of burning are :

(1) The large thorns must be completely burnt or should as far as possible be made to burn themselves.

(2) The small tufts of thorns must be scorched and rendered harmless.

(3) The leaves should not be burnt at all.

(4) The leaves should not be smoked.

These fine thorns if left untouched by the flame may do much harm by causing soreness of the mouth and irritation of the stomach and bowels. It is readily seen that a clear hot flame is needed without the necessity of keeping the cactus for long close to a hot fire. The ideal method is the use of an oil blow lamp. There are two types of lamps experimented with—(a) The "Primus" type with coil tube burner. The estimated cost now in Bombay of these lamps are Rs. 60. (b) The "Richardson & Cruddas" lamps are obtainable in large quantities and are manufactured in Bombay to the design of the experts. They are made with Edgley patent burners and are sold at Rs. 38. The burners require to be heated longer than in the Primus type and does not work properly until the blow flame itself has been burning for two or three minutes.

As it is difficult to get cultivators to use these lamps properly or keep them in order and as a cheap oil supply is a difficulty, the next best method is advocated.

It is pointed out that for smith's work with an ordinary blower (bellows) what is wanted is an intensely hot fire and no flame. For cactus burning what is wanted is as little fire as possible and a large mass of clear flame. For the former charcoal coke or coal is needed, for the latter light match-wood or even good fuel wood is more effective. "The whole success of the method depends on the way in which it is worked. The maintaining of a steady blast neither too strong nor too weak, the feeding on of wood at the right rate and in the proper place over the blowing nozzle according to the kind which is used, and the holding of the prickly pear in exactly the proper way over the flame and its removal the moment it is sufficiently burnt are things which have to be very carefully taught and learnt. A good gang of men can prepare 2,400 lb. a day with the same equipment with which an untrained lot will turn out only 400."

It is suggested that a smith's forge can be used for this work, but it is necessary to repeat the need for careful training and close supervision of the workers. You must burn the thorns off thoroughly, and yet not burn or smoke the leaves otherwise the cattle will never eat the stuff which even under the best conditions needs some persuasion.

THE DIFFICULTY IN MAKING CATTLE EAT CACTUS.

The first difficulty to overcome is how successfully to prepare the stuff, the next difficulty is to make the cattle eat it. An animal will never take to the stuff unless it is actually starving. The pear will need to be rubbed over with finely ground salt or sweet oil and scented fragrantly before the starving animals will take to it, but once they begin eating they will eat freely.

At Kirkee (Poona) the method adopted is to mix an increasing amount of prickly pear daily so intimately with grass or poonac, so that the animal cannot separate the two.

It is also noted that one animal begins to eat, very often the others with it will follow its example so that it is a good thing to tie up an animal already trained where others are being taught for the first time.

CACTUS AN INSUFFICIENT FOOD.

It is important to note the value of cactus as a fodder. It has about the same food value as ¼ the weight of dry sorghum fodder. It will make a complete and sufficient diet if combined with 6% its weight of some concentrated feeding stuff as cotton seed.

The daily rations used at Poona are:—

1st period—	Cactus	10	lb.
	Grass	10	,,
	Cotton seed	2	,, (= 2½ lb. gram = 1 lb. gingelly poonac = 5 lb. grass).
2nd period—	Cactus	20	lb.
	Grass	8	,,
	Cotton seed	1½	,,
3rd period—	Cactus	30	lb.
	Grass	4	,,
	Cotton seed	1	,,

It is important to lay stress upon the insufficiency of cactus alone for growing or working or milking animals. Cactus may just maintain the life of an animal that is starving, but the animal cannot be fed on cactus and then used for draught purposes. The effects of feeding cactus is to cause diarrhœa which can be corrected by feeding dry grass. Dysentery with blood in the dung is a sign that the pear is carelessly prepared and insufficiently burned.

HOW TO START WORK ON PRICKLY PEAR.

The Revenue Department of Bombay recommends the following :—

First.—Visit a village and personally demonstrate the preparation of cactus with lamp and hearth. Have the cattle actually fed with the prepared prickly pear. Explain the advantages and difficulties of the system.

Second.—Induce some of the villagers to send a certain number of cattle with men in charge to an established camp to have the cattle trained to eat prickly pear and to have the men trained in preparation and feeding.

Third.—Send a complete equipment with a trained demonstrator back to the village with these trained villagers. After a week or so, hand over the equipment to a local Committee for working.

These camps are not intended to be centres that endeavour to cope with a widespread fodder famine in a district. They may either be:—

(1) Maintenance camps for animals purchased by Government, charitable funds or local committees to be fed till the rains and then re-sold.

(2) Maintenance camps for boarders where owners can send their cattle to be fed on payment of a monthly rate.

(3) Instructional camps to which owners can bring their cattle or send them with servants, to have the cattle trained to eat, and the men trained to prepare and feed the cactus.

(4) Depôts for the preparation and free distribution and sale of burnt cactus or mixed fodder consisting of cactus with the proper proportion of other feeding stuffs.

Further details are given for such district organization work, which rightly comes after the preliminary difficulties are overcome. The question of prickly pear as fodder for cattle in a place like Jaffna may be summarized thus.

Cactus can only be fed as a ration to maintain the life of an animal that will otherwise die of starvation. It must be supplemented with concentrates to make a complete daily ration. The pear needs very careful preparation under skilled supervision and trained workers.

The cattle need to be trained to eat it. In short, cactus is and can be only the "drowning straw" to a district overwhelmed by a very bad fodder famine.

H. L. van Buuren.

LIME CULTIVATION IN DOMINICA.

PROTECTION FROM WIND, AND DRAINING.

In the Report on the Agricultural Department, Dominica, for the year 1917-18, a general review of which appears on another page of the present issue of this Journal, a large portion is naturally devoted to various problems connected with the lime industry. Mr. J. Jones, Agricultural Superintendent and Curator of the Botanic Gardens, is an expert in questions relating to the cultivation of the lime tree: his views therefore have special interest and value. It is intended to publish in these pages a series of articles reproduced from his report, as tending to the benefit of growers of limes in general.

A lime experiment station was started in April, 1913 on Government land beyond Morne Bruce, and within easy distance of the Botanic Gardens. March 31, 1918, saw the completion of five years' work in this station.

The expenditure on the station for the five years was £650, while the receipts from the produce amounted to £466 15*s.* 11*d.*

The financial results are not unsatisfactory, and from now on there should be considerable increase in the receipts, and only a small increase of expenditure. The excess of receipts over expenditure during the next five years should be sufficient to provide a small up-to-date factory, after which the experiment station should be a source of profit.

The special value, however, of the work at this experiment station arises from the important information which is being obtained bearing upon problems connected with the cultivation of lime trees. This information on points such as protection from wind, draining, manuring and mulching, budding and other methods of propagation, pruning and general care of the trees, as affecting the yield, all tends to more efficient cultivation, and to the benefit of the lime industry.

On taking over the land there were found to be about 4 acres of lime trees twenty years old, which had been abandoned for many years. About 2 acres of these were growing on steep lands, and the remainder on slopes of a moderate fall. On the latter it was possible to start eight manurial plots of ¼ acre each. The trees were originally planted 12 feet by 12 feet, but on the plots they were thinned to 24 feet by 24 feet. This removal of three trees out of every four appeared to be a drastic measure, but the results fully justified the work. The effect of drainage and manure on the health, growth and yield of the trees was remarkable.

The area now under bearing limes, and young trees just commencing to bear is 7½ acres. To this must be added 5 acres in course of being established. Another 3 acres will be planted shortly, which will bring the total under lime cultivation to over 15 acres. There is also the possibility of further additions in the future. The crop during the twelve months ended March 31, was 649 barrels of fruit.

Protection from wind.—The upper part of the experiment station, which is now nearly established in limes, is exposed to the prevailing winds. To protect the cultivation, wind belts of the well-known Pois doux (*Inga laurina*) are being formed. Up to the present the cultivation, has been helped by subsidiary wind-belts of the Nicaragua shade tree (*Gliricidia maculata*), a quick growing and useful plant for this purpose. A considerable amount of protection was also afforded to young limes by *Tephrosia candida*, a leguminous plant grown as a green dressing.

The lower part of the station, a portion of which it is hoped to establish in limes as time goes on, is a straight and narrow valley down which the wind rushes. The slopes in some instances are too steep and exposed, and the

layer of soil too thin to plant, but the depressions will grow limes if surrounded by wind belts. The poor and exposed lands can be used to grow certain plants for use as mulches, or native and exotic trees for use as firewood.

Happily this matter of wind-breaks is well understood in Dominica. A very large part of the area under limes in the Island is protected from the wind by the natural conformation of the land, of which every advantage is taken by planters. Where the land is exposed, experienced men seek to mitigate the effect of the wind by growing shelter-belts of the Pois doux, Galba, and other trees. It is only the young and inexperienced who do not see the need of providing shelter in the first instance. By failing to do so they add greatly to the cost of establishing their plantations, and buy their experience at a ruinous price. Whenever new lands exposed to the wind are about to be planted a carefully thought out scheme of wind-belts should be planned, and carried into effect as early as possible.

Reference has been made to the use of the Nicaragua shade tree (*Gliricidia maculata*) as a secondary wind-belt. This plant has proved very helpful in the experiment station. Cuttings of about 3 feet long, of which a foot should be placed in the ground, are found to strike readily, rapidly. If small holes are made for the cuttings, and these are placed in the ground with care, there are no failures. Unfortunately, on some estates the holes are made with an iron bar, and the cutting is then forced into the hole. This action strips off the bark, and the cuttings cannot emit roots. It requires the same care to place a cutting in the ground as it does to place out a plant.

For use as a secondary wind-belt, a row of *Gliricidia maculata* should be run between every third and fourth row of limes across the direction of prevailing winds. It needs to be cut back twice a year. A few weeks after being topped it is again affording some protection, and on each cutting it yields a good supply of mulch for the lime trees. In order not utterly to deprive the young lime trees of shelter at the time of cutting back, it is best to top alternate rows every three months. The tree is deciduous, but by topping it is kept in an evergreen state practically all the year round, and is made by these means to afford protection even in the dry season of the year. Planted on either side of a permanent wind-belt like Pois doux it is helpful in bringing on these plants during the early years of their existence.

Draining.—It may be stated that this cultural operation is generally neglected on the majority of lime estates, until it becomes urgently necessary. It is then usually carried out in such a manner as to give an additional check to the already severely tried trees, and to add to the immediate difficulties of the management.

When draining operations have at last to be carried out on established estates, owing to the low vitality of the trees, the work, in the majority of cases, is done in a very unsatisfactory way. Work, which should be done gradually, and extended over at least three seasons, is attempted at a single operation. The drains are usually made too narrow and two deep for their width. The earth, which is chiefly subsoil, is thrown upon the adjoining surface soil. Thus, a living soil, from which the trees derive their nourishment, is largely covered by a dead soil, which needs a lengthy exposure to the sun, air, and rain, and to the effects of weed growth, and to applications of organic manures, before it becomes fertile and helpful to the lime trees. This covering of the living surface soil often to a depth of several inches gives a further check to the trees, and although draining, even when carried out on unsound lines, will ultimately result in some improvement, the immediate effect of faulty operations is to further delay the recovery of the plantation. In old cultivations in which draining has been neglected, it would prove a sounder plan to drain gradually by instalments, rather than to attempt the whole of the work at one time.

In new plantations these operations should be carried out during the years between the time of planting and the coming into bearing of the trees, that is, a period of three or four years. On flat and moderately undulating lands a drain should be run between each two rows, for under such conditions the trees would be spaced at 20 feet to 25 feet apart or more. This plan results in what is called the "bank" or "bed" system, that is, the soil from the drain is thrown up until the highest level is in a line with the row of tree stems, whence it gradually falls on either side to the drains. Thus on flat, and on moderately undulating lands, the fields are formed of succession of beds. This plan is formal in appearance and effective in its operation.

When fields have been lined and planted with limes, which is usually done between June and November—the wet season—steps should be taken the following dry season—January to May—in the work of beginning a system of drainage which, if carried out on sound lines, will be destined to play a great part in maintaining the health of the trees, and in prolonging the life of the plantation.

During the first dry season after the trees are planted, surface drains about 2 feet wide and 10 to 12 inches deep, should be dug. The soil from the drains should be spread over the land, to which it will afford a light top dressing. The next season the sides of the drain should be broken in, and the top dressing repeated. The third year the drains should be deepened a few inches in order to afford the annual dressing. By this time, the "bed" system will be attained, but as drains always tend to silt up, especially so in a wet country like Dominica, they should be annually cleaned, and kept at a proper depth. This secures a valuable top dressing for the trees each year. Procedure on the above lines is very helpful to the young limes. Under such conditions they show great vigour. By the time the draining system is complete, the trees are commencing to bear.

It is practically certain that draining, as outlined above, when applied to lime trees in course of being established, will mitigate the critical period in the life of young lime trees, and it may, in conjunction with shelter, such as is given by Tephrosias and Indigoferas, overcome it.

In many instances in Dominica limes are planted on steep slopes. The usual custom in these cases is to plant closely, 10 feet by 10 feet, or 12 feet by 12 feet, nothing or very little in the way of drainage being attempted. The trees under these conditions do fairly well whilst young, but once having passed the vigorous stage characteristic of the first years of maturity, their appearance and yield of fruit are decidedly poor. This is largely due to surface washing, by which the best soil is carried away each season on the occasion of torrential rains. It would appear that a good deal more could be got out of such cultivation by planting at wider distances, and by following the plan of surface drains recommended on flat or moderately undulating lands. Experiments with a view of obtaining information on this point have been started at the experiment station.

It is almost needless to point out that surface drains on slopes should always run across the fall of the land, and be able to deliver the water to the main drains slowly, and with a minimum of rush. In a hilly country like Dominica, the main outlets are usually rivers or streams, ravines, or natural depression in the land.

It must not be overlooked that considerable areas of limes are grown and do well in Dominica on what may be termed boulder lands, that is, land strewn with rocks to such an extent that very little soil is to be seen. Such areas are usually naturally well drained, which is fortunate, as the ordinary methods could not be applied in these instances.—AGRICULTURAL NEWS, Vol. XVIII, No. 442.

LIBRARY.

ORCHID CULTURE FOR BEGINNERS.[1]

This small volume has been prepared by one of the orchid enthusiasts of Ceylon and can be recommended to all collectors of orchids in the Tropics. It is well printed and contains a number of useful illustrations.

The first part of the book contains hints upon the housing of orchids in the tropics, attention to potting, propagation and cultivation. This part will be useful to beginners in orchid culture, giving general instructions as to general management. The second part of the book deals with some of the more well-known species of orchids and the methods of cultivation which have been found to be most successful.

The book is based very largely upon the practical experience of an enthusiastic collector and should be useful to less experienced growers of orchids.

A TEXT BOOK OF ELEMENTARY BOTANY IN TAMIL.[2]

The book has been prepared by the Lecturing Botanist to the Agricultural College at Coimbatore, Madras, and has been revised in a third edition.

This book can be recommended for use in Tamil speaking schools and should be useful to those Tamils in Ceylon that are interested in Nature Knowledge, Botany, or Agriculture. The work is illustrated with a large number of carefully prepared drawings of familiar tropical plants of economic and ornamental importance.

PRACTICAL LESSONS IN TROPICAL AGRICULTURE,[3] BOOKS I. II. III.

These books have been prepared by a former instructor in Agriculture in the Philippine normal school. They are designed to help pupils in Philippine schools in acquiring a knowledge of elementary tropical agriculture.

The first book deals with the plant, its parts, and the practical applications of the laws governing plant growth.

The second book deals with the general elements of agricultural operations and with particular crops such as rice, coconut, sugar-cane, maize, tobacco, fibre crops, pineapples, castor and betel. Some details are also given regarding silk and poultry rearing.

The third book deals with Fodder crops, green manure crops, fruits and weeds, whilst details are also given in regard to horses, cattle, buffalos and other farm animals, farm book keeping and general business.

The volumes have been carefully prepared and are profusely illustrated. They can be recommended for use in tropical agricultural schools and in schools where nature study in respect of economic products is carried on.

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1. ORCHID CULTURE FOR BEGINNERS by F. A. E. PRICE. Printed by Colombo Apothecaries Company, Colombo, Ceylon, Price Rs. 5·00.

2. A TEXT BOOK OF ELEMENTARY BOTANY in Tamil by K. RANGACHARIAR, 3rd Edition, Macmillan & Co., Ltd., Madras, Bombay, Calcutta and London.

3. PRACTICAL LESSONS IN TROPICAL AGRICULTURE by R. L. CLUTE, Published by the World Book Coy., New York and Manila.

ANIMAL DISEASE RETURN FOR THE MONTH ENDED 30th JUNE, 1919.

Province, &c.	Disease	No. of cases up to date since Jan. 1st. 1919.	Fresh cases	Recoveries.	Deaths.	Balance Ill.	No. Shot.
Western	Rinderpest	475	30	71	369	13	22
	Foot-and-mouth disease	220	3	220	—	—	—
	Anthrax	—	—	—	—	—	—
	Rabies	2	—	—	2	—	—
Colombo Municipality	Rinderpest	258	—	—	—	—	—
	Foot-and-mouth disease	8	—	—	—	—	—
	Anthrax	13	—	—	—	—	—
	Rabies	19	—	—	—	—	—
Cattle Quarantine Station	Rinderpest	33	—	—	—	—	—
	Foot-and-mouth disease	10	—	—	—	—	—
	Anthrax	209	—	—	—	—	—
Central	Rinderpest	219	61	29	168	22	—
	Foot-and-mouth disease	65	6	64	—	1	—
	Anthrax	7	1	—	7	—	—
	Rabies	11	—	—	11	—	—
Southern	Rinderpest	10	—	3	7	—	—
	Foot-and-mouth disease	2226	230	2137	19	70	—
	Anthrax	—	—	—	—	—	—
Northern	Rinderpest	80	6	26	54	—	—
	Foot-and-mouth disease	580	—	416	35	129	—
	Anthrax	68	6	—	68	—	—
Eastern	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	1212	410	1071	141	—	—
	Anthrax	—	—	—	—	—	—
North-Western	Rinderpest	139	31	32	104	1	2
	Foot-and-mouth disease	374	—	323	44	6	1
	Anthrax	—	—	—	—	—	—
	Rabies	1	—	—	1	—	—
North-Central	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	852	—	838	14	—	—
	Anthrax	—	—	—	—	—	—
Uva	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	4262	1572	3752	47	463	—
	Anthrax	—	—	—	—	—	—
Sabaragamuwa	Rinderpest	296	85	16	246	1	33
	Foot-and-mouth disease	307	110	307	—	—	—
	Anthrax	—	—	—	—	—	—
	Rabies	1	—	—	1	—	—

Colombo, July 3rd, 1919.

G. W. STURGESS, G.V.S.

METEOROLOGICAL.

JUNE, 1919.

Station	Temperature: Mean Daily Shade	Temperature: Difference from average	Mean Humidity	Mean amount of clouds 0=clear. 10=Overcast	Mean Wind direction during month	Daily Mean Velocity	Rainfall: Amount	Rainfall: No. of Rainy days	Rainfall: Difference from average
	°	°	%			Miles	Inches		Inches
Colombo Observatory	81·9	+ 0·3	82	8·3	WSW	160	3·59	19	- 4·06
Puttalam	82·0	- 0·1	80	5·4	SW	276	1·59	2	- 0·14
Mannar	83·6	- 1·1	77	7·4	SW	218	1·59	4	+1·00
Jaffna	83·0	- 0·8	82	4·4	SW	365	3·38	5	+2·73
Trincomalee	85·0	- 0·6	—	—	—	—	2·23	2	+ 0·95
Batticaloa	85·6	+ 0·4	66	5·1	Variable	79	1·51	7	+ 0·50
Hambantota	82·3	+ 0·7	78	5·9	SW	389	2·88	12	+ 0·55
Galle	80·6	0	84	7·7	WNW	252	6·48	24	- 1·66
Ratnapura	80·8	+ 0·2	82	8·0	—	—	10·31	30	- 9·61
Anu'pura	81·8	- 1·4	77	7·6	—	—	2·76	3	+ 1·38
Kurunegala	80·5	- 0·5	76	9·8	—	—	5·55	22	- 2·75
Kandy	76·6	0	79	9·0	—	—	7·32	26	- 2·10
Badulla	75·4	+ 0·1	74	6·8	—	—	0·88	4	- 1·42
Diyatalawa	70·5	0	68	6·2	—	—	0·74	6	- 1·33
Hakgala	61·4	- 0·4	88	8·5	—	—	7·36	29	- 0·33
N. Eliya	60·6	+ 0·8	86	9·7	—	—	9·36	28	- 3·44

The rainfall was slightly above normal to the North, the East and around the Hatton District; elsewhere it was mostly in deficit. That experienced to the North was due to the cyclonic conditions that prevailed during the first week of the month. The number of days on which rain was experienced was mostly above normal.

The sky was clouded to an extent greater than usual.

The temperature did not differ greatly from that of the average.

In direction the wind was normal; but in force slightly stronger than usual.

Air Pressure was slightly above normal.

J. E. EVANS,

Acting Supdt., Colombo Observatory

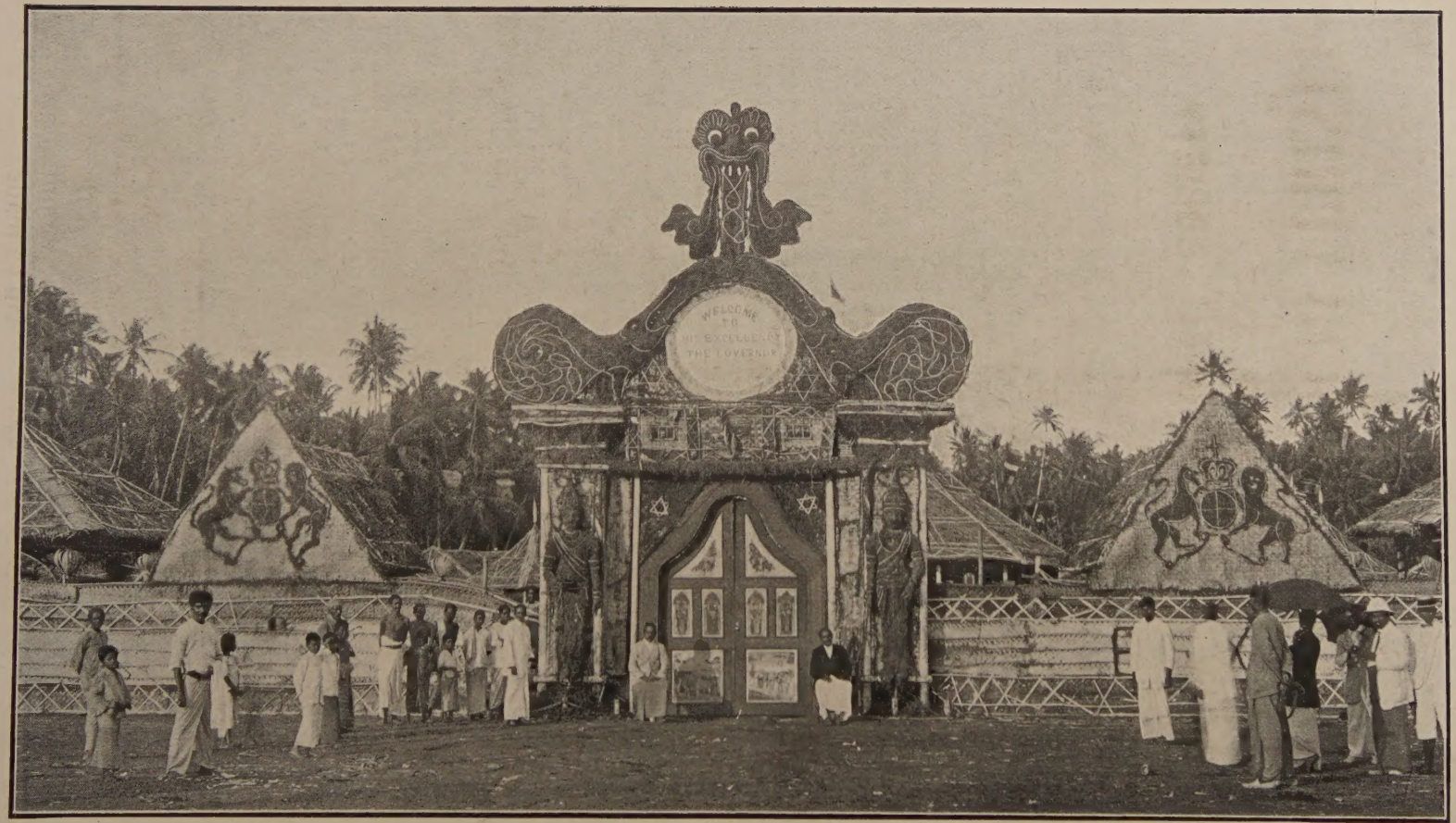

Photo by Galle and Matara Photo Co.

ENTRANCE TO MATARA AGRICULTURAL SHOW GROUNDS.